A
000 510 138
1

Digitized by the Internet Archive
in 2008 with funding from
Microsoft Corporation

http://www.archive.org/details/systemofgynecolo01manniala

A

SYSTEM OF GYNECOLOGY.

BY AMERICAN AUTHORS.

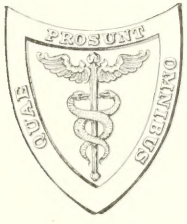
EDITED BY

MATTHEW D. MANN, A.M., M.D.,

PROFESSOR OF OBSTETRICS AND GYNECOLOGY IN THE MEDICAL DEPARTMENT OF THE UNIVERSITY OF BUFFALO, N. Y.

VOLUME I.

ILLUSTRATED WITH THREE COLORED PLATES AND TWO HUNDRED AND ONE ENGRAVINGS ON WOOD.



PHILADELPHIA:
LEA BROTHERS & CO.
1887.

WP100
M282a
1887
v.1

Entered according to Act of Congress, in the year 1887, by
LEA BROTHERS & CO.,
in the Office of the Librarian of Congress at Washington. All rights reserved.

WESTCOTT & THOMSON,
Stereotypers and Electrotypers, Philada.

WILLIAM J. DORNAN,
Printer, Philada.

PREFACE.

In all departments of science the largest results are to be obtained by division of labor and combination of effort. In Medicine this is especially true, and the favor with which the profession has greeted recent systems of Practice and Surgery, concentrating the experience of leading men on each subject, shows that such a plan of composition is more satisfactory than the effort of a single author to treat exhaustively all the details of an extensive branch of practice. By a careful preliminary survey of the ground, and the assignment of each subdivision to a practitioner who has made it the special subject of study, omissions are avoided, every article is authoritative, and each is treated with the fulness to which its importance entitles it.

Gynecology has now grown to an extent which requires for its thorough treatment this co-operation of representative men; and it is eminently fitting that the science which is in so great a degree of American origin should be thus presented by American practitioners. The labors of the Editor have been principally confined to the selection of contributors and the assignment of subjects, and it is with no little pride that he refers to the list of eminent gentlemen whose co-operation has secured in advance the position which the work must assume as the leading authority on its subject. The common effort has been to render each article not only full and complete, but thoroughly practical, special regard being paid to the needs of the general practitioner as well as to those of the specialist. The responsibility for the views presented rests wholly with the contributors; and if there are occasionally found more or less overlapping and some differences of opinion on certain disputed points, this carries with it the cor-

2246

relative advantage of enabling readers to compare different views and to value them at their worth.

In conclusion, the Editor would express his thanks to the contributors for the courtesy and zeal which have characterized their co-operation, and he would further acknowledge his indebtedness to his predecessors, Drs. Charles S. Ward and Henry D. Nicoll, not only for their preliminary labors, but for the good-will which they have so generously manifested.

CONTRIBUTORS TO VOLUME I.

HENRY C. COE, A. M., M. D., New York City,

Pathologist to the Woman's Hospital in the State of New York; Visiting Obstetrician to the Infant Asylum; Instructor in Gynecology at the New York Polyclinic.

EMILIUS C. DUDLEY, A. B., M. D., Chicago,

Professor of Gynecology in the Chicago Medical College; Gynecologist to Mercy Hospital and to Cook County Hospital, and to St. Luke's Hospital.

HENRY J. GARRIGUES, A. M., M. D., New York City,

Professor of Practical Obstetrics at the New York Post-graduate School and Hospital; Obstetric Surgeon to the New York Maternity Hospital; Obstetrician to the New York Infant Asylum; Gynecologist to the German Hospital.

EGBERT H. GRANDIN, A. B., M. D., New York City,

Instructor in Gynecology at the New York Polyclinic; Obstetric Surgeon to the New York Maternity Hospital.

A. REEVES JACKSON, A. M., M. D., Chicago,

Professor of Gynecology in the College of Physicians and Surgeons of Chicago, and the Chicago Policlinic; Hon. Fellow Boston Gynecological and Detroit Gynecological Societies; Fellow of the American Gynecological, British Gynecological, and Chicago Gynecological Societies; Consulting Surgeon of the Dispensary of the Women's Christian Association; Chief of the Gynecological Department of the West Side Free Dispensary; formerly Surgeon-in-chief of the Woman's Hospital of the State of Illinois.

EDWARD W. JENKS, M. D., LL.D., Detroit,

Fellow of the American Gynecological Society and the Obstetrical Society of London; Corresponding Fellow of the Boston Gynecological Society; Honorary Member of the Cincinnati Obstetrical Society and the State Medical Associations of Maine, Ohio, Michigan, etc.; formerly President and Professor of Gynecology and Obstetrics in Detroit Medical College, and late Professor of Gynecology in Chicago Medical College.

MATTHEW D. MANN, A. M., M. D., Buffalo.

Professor of Obstetrics and Gynecology in the Medical Department of the University of Buffalo; Gynecologist to the Buffalo General Hospital.

RICHARD B. MAURY, M. D., Memphis.

Professor of Gynecology in the Memphis Hospital Medical College.

CHAUNCEY D. PALMER, M. D., Cincinnati,

Professor of Obstetrics and the Medical and Surgical Diseases of Women and Clinical Gynecology in the Medical College of Ohio; Gynecologist to the Cincinnati Hospital.

THADDEUS A. REAMY, A. M., M. D., Cincinnati,

Professor of Clinical Gynecology in the Medical College of Ohio; Gynecologist to the Good Samaritan Hospital; Obstetrician and Gynecologist to the Cincinnati Hospital.

ALPHONSO D. ROCKWELL, M. D., New York City,

Formerly Electro-therapeutist to the Woman's Hospital in the State of New York; Member of the American Neurological Association.

ALEXANDER J. C. SKENE, M. D., Brooklyn,

Professor of the Medical and Surgical Diseases of Women in the Long Island College Hospital, Brooklyn, N. Y.

ELY VAN DE WARKER, M. D., Syracuse, N. Y.,

Surgeon to the Central New York Hospital for Women; Fellow of the American Gynecological Society; Fellow of the New York State Medical Association.

W. GILL WYLIE, M. D., New York City,

Professor of Gynecology in the New York Polyclinic; Gynecologist to Bellevue Hospital; Surgeon to St. Elizabeth's Hospital; Member of American and British Gynecological Societies; Fellow of New York Academy of Medicine.

CONTENTS OF VOLUME I.

PAGE

HISTORICAL SKETCH OF AMERICAN GYNECOLOGY. By Edward W. Jenks, M. D., LL.D. 17

THE DEVELOPMENT OF THE FEMALE GENITALS. By Henry J. Garrigues, A. M., M. D. 68

THE ANATOMY OF THE FEMALE PELVIC ORGANS. By Henry C. Coe, M. D., M. R. C. S. 95

MALFORMATIONS OF THE FEMALE GENITALS. By Henry J. Garrigues, A. M., M. D. 235

GYNECOLOGICAL DIAGNOSIS. By Egbert H. Grandin, A. B., M. D. 283

GENERAL CONSIDERATION OF GYNECOLOGICAL SURGERY. By E. C. Dudley, A. B., M. D. 328

GENERAL THERAPEUTICS. By Alexander J. C. Skene, M. D. . . . 363

ELECTRICITY IN GYNECOLOGY. By Alphonso D. Rockwell, A. M., M. D. 383

MENSTRUATION, AND ITS DISORDERS. By W. Gill Wylie, M. D. . 408

STERILITY. By A. Reeves Jackson, A. M., M. D. 441

DISEASES OF THE VULVA. By Matthew D. Mann, A. M., M. D. . . 477

THE INFLAMMATORY AFFECTIONS OF THE UTERUS. By C. D. Palmer, M. D. 541

SUBINVOLUTION OF THE VAGINA AND UTERUS. By Thaddeus A. Reamy, A. M., M. D. 637

PERIUTERINE INFLAMMATION. By Richard B. Maury, M. D. . . . 675

PELVIC HÆMATOCELE AND HÆMATOMATA. By Ely Van de Warker, M. D. 735

LIST OF WOOD ENGRAVINGS.

Fig.		Page
1.	Section of Fœtal Rabbit	69
2.	Section of Posterior Part of Fœtal Rabbit	69
3 and 4.	Skene's Urethral Glands	70
5.	Cross-section of Urethra	71
6.	Cross-section of Urethra, showing Skene's Glands	72
7.	Skene's Gland laid open	72
8.	Fœtus of Thirty-five Days	73
9.	Genital Organs of Embryo Cattle	74
10.	Internal Genitals of Female Human Fœtus	75
11.	Internal Genitals of Male Human Fœtus	75
12.	Cross-section of Fœtal Ovary	76
13.	Cross-section of Ovary of Bitch of Six Months	77
14.	Cross section of Ovary of Human Fœtus	78
15.	Cross-section through Ovarian Region of Fœtus	80
16.	Ovary of Human Fœtus at Tenth Week	81
17.	Ovary of Human Fœtus at Tenth Week (magnified)	81
18.	Formation of Ova	81
19.	Permanent Epithelium of Ovary	81
20.	Ovary in Thirty-sixth Week	82
21.	Cross-section of Ovary at Birth	82
22.	Graafian Follicles at Birth	82
23.	Graafian Follicle Seven Months Old	83
24.	Human Ovum	84
25.	Primordial Ova	85
26.	Wolffian Body of Rabbit	86
27.	Section of Genital Cord	88
28 and 29.	Ovaries, Tubes, and Uterus at Tenth Week	88
30.	Viscera at Fifth Month	89
31 and 32.	Urogenital Sinus	89
33.	Urogenital Sinus at Different Ages	90
34 and 35.	External Genitals in Fœtus	93
36.	Mesial Section of External Genitals	96
37.	External Genitals	97
38.	Veins of Vulva and Perineum	103
39.	Veins of Vagina and Vulva	105
40.	Venous Plexuses of Clitoris	106
41.	Perineal Septum	107
42.	Arteries and Veins of Vagina and Uterus	122
43 and 44.	Sections of the Vaginal Wall	123
45.	Section of Mucous Membrane of Uterus	136
46.	Interior of Cervix	137
47.	Utricular Glands	140
48.	Section of Decidua	141

Fig.		Page
49.	Ovarian and Uterine Arteries	144
50.	Nerves of the Uterus	145
51.	Transverse Section of the Body at Brim of True Pelvis	146
52.	Horizontal Section, showing Uterus and Ligaments	158
53.	Pubic Termination of Round Ligaments	159
54.	Cross-section of Tubes	163
55.	Cross-section of Tubes, showing Lymph-spaces	165
56.	Section of Ovary	171
57.	Section of Ovary (low power)	173
58.	Section of Ovary in Infant	174
59.	Frozen Section of Pelvis	184
60.	Section of Vesico-vaginal Septum	187
61.	Muscular Fibres of Bladder	190
62.	Epithelium of Bladder	190
63.	Relation of Ureters	193
64.	Surgical Relations of Ureters	195
65.	Rectum Inflated	198
66.	Section of End of Rectum	200
67.	Diagram of Pelvic Peritoneum	205
68.	Cross-section of Pelvis	206
69.	Diagram of Broad Ligaments	208
70.	Diagram of Broad Ligaments	209
71.	Reflections and Pouches of Pelvic Peritoneum	211
72.	Mesial Section of Pelvis	217
73.	Model of Uterine Supports	221
74.	Fascia of Pelvic Floor	223
75.	Muscles of Pelvic Floor	224
76.	Section of Pelvis through Vagina	225
77.	Attachments of Muscular Floor of Pelvis	226
78.	Perineal Septum	231
79.	Muscular Floor of Pelvis in Labor	233
80.	Rudimentary Uterus (Nega)	240
81.	Rudimentary Uterus (Langenbeck)	241
82.	Uterus Bipartitus	242
83.	Bipartite Uterus and Ovaries	244
84.	Uterus Didelphys	245
85.	Uterus Unicornis	246
86.	Uterus Bicornis Duplex	247
87.	Uterus Bicornis Duplex	248
88.	Uterus Bicornis Unicollis	249
89.	Uterus Arcuatus	249
90.	Uterus Septus Duplex	250
91.	Uterus Septus Uniforis	251
92 and 93.	Double Vagina	251
94.	Infantile Uterus	254
95.	Infantile Uterus, coronal section	255
96.	Uterus Incudiformis	256
97.	Persistent Cloaca	261
98.	Persistent Sinus Urogenitalis	261
99.	The Hymen	262
100.	Hypospadias	265
101.	Epispadias	266
102.	Lateral Hermaphroditism	271
103.	Internal Genitals of Fig. 102	271
104.	Internal Genitals, left side	272

Fig.		Page
105 and 106.	Genitals of Carl Hohmann	274
107 and 108.	Carl Hohmann	275
109 and 110.	Supposed Section of Hohmann	275
111.	Chadwick's Table	294
112.	Chadwick's Table	295
113.	Dagget's Table	295
114.	Dagget's Table	296
115.	Simpson's Sound	303
116.	Fergusson's Speculum	305
117.	Brewer's Speculum	305
118.	Nott's Speculum	306
119.	Left Lateral Position	309
120.	Sims's Depressor	311
121.	Sims's Speculum	311
122.	Hunter-Erich Speculum	311
123.	Thomas-Mann Speculum	312
124.	Mundé's Speculum	313
125.	Emmet's Tenaculum	314
126.	Sims's Tenaculum	314
127.	Emmet's Probe	315
128.	Skene's Endoscope	317
129.	Kelsey's Rectal Speculum	318
130.	Goodell's Dilators	319
131.	Palmer's Dilators	320
132.	Hanks's Dilator	320
133.	Emmet's Water-Dilator	321
134.	Molesworth's Dilator	322
135.	Tupelo Tents	322
136.	Thomas's Dull Curette	324
137.	Dieulafoy's Aspirator	326
138.	Emmet's Aspirator	326
139.	Simon's Speculum	342
140.	Emmet's Double Tenaculum Forceps	343
141.	Emmet's Double Tenaculum Forceps	343
142.	Sims's Sponge-holder	343
143.	Emmet's Scissors	344
144.	Emmet's Scissors, curved	344
145.	Emmet's Scissors, strongly-curved	344
146.	Emmet's Ball-and-Socket Knife	345
147.	Uterine Tenaculum	345
148.	Method of Denudation	346
149.	Needles	347
150.	Emmet's Needle-Forceps	348
151.	Needles Threaded with Loop	348
152.	Counter-pressure to Needle	349
153.	Counter-pressure to Hook	349
154.	Vulsellum Forceps	349
155.	Suture in Position	350
156.	All Sutures in Position	350
157.	Slipknot on Suture	351
158.	Twisting with a Tenaculum	351
159.	Shouldering a Suture	351
160.	Twisting Forceps	352
161.	Sims's Shield	352
162.	Twisting a Suture	352

FIG. PAGE
163. Bending Twisted Wire 352
164. Removing a Silver Suture 353
165. Sponge Tent 355
166. Laminaria Tent 356
167. Introducing a Tent 357
168. Frasch's Dilators 358
169. Schultze's Dilators 358
170. Neal's Dilators 358
171. Thomas's Dull Wire Curettes 360
172. Simon's Sharp Spoon 361
173. Sims's Curette 418
174. Sims's Dilator 427
175. Wylie's Cervical Protector 428
176. Wylie's Intra-uterine Drainage-tube 429
176½. Veins of Vulva 479
177. Anterior Vaginal Hernia 484
178. Lupus Prominens 522
179. Palmer's Intra-uterine Canula 546
180. Davidson's Syringe 556
181. Vaginal Irrigator 556
182. Peaslee's Dilators 559
183. Palmer's Dilator 560
184. Conoid Cervix 560
185. Dilated Canal 561
186. Hard-rubber Probe Applicator 564
187. Applicator 577
188. Self-retaining Tenaculum 577
189. Palmer's Intra-uterine Medicator 579
190. Applicator Syringe 580
191. Sims's Applicator 580
192. Applicator Syringe 581
193. Récamier's Curette 596
194. Thomas's Curette 596
195. Sims's Curette 597
196. Simon's Spoon 597
197. Emmet's Curette Forceps 597
198. Buttle's Spear 613
199. Knife for Intra-uterine Scarification 614
200. Reflections of Pelvic Peritoneum 683
201. Sagittal Section of Pelvis 685

PLATE I.

Lupus Hypertrophicus (Duncan), more properly Fibroma Diffusum . . . 527

PLATE II.

1. Erosion of the Cervix (Meigs) 550
2. Follicular Erosion with Slight Laceration (Mundé) 550
3. Granular Degeneration of an Elongated Cervix (Meigs) 550
4. Erosion, Cystic Enlargement, Catarrh of Cervix (Meigs) 550

PLATE III.

1. Chronic Hyperæmia, Catarrh, and Enlargement of the Cervix (Meigs) . . 601
2. Chronic Metritis and Endometritis (Meigs) 601

HISTORICAL SKETCH OF AMERICAN GYNECOLOGY.

By EDWARD W. JENKS, M. D., LL.D.,
Detroit, Michigan.

As in the case of most nations, so in that of medicine, of whose history it forms a part, the earliest dawnings are traceable to tradition, and in many instances the historian is obliged to go back of authenticated records for the material with which to construct the foundation of his story. In writing a history of American medicine in any of its divisions this difficulty does not, however, present itself, for, like the American people itself, it arises from a foundation laid in centuries of Transatlantic life. While, therefore, in essaying a history of the achievements of American surgeons in the treatment of diseases peculiar to women I am not obliged to analyze aught which is of doubtful authenticity as a basis for a starting-point, it has seemed to me that a brief résumé of the historical facts which form the foundation of gynecology as it exists in America to-day will greatly assist to the clearest conception of the superstructure. The explorations of antiquarians of later years into that which has been hidden by the débris of centuries has, moreover, unearthed so many of the prototypes of modern discoveries that a consideration of the latter could scarcely be held to be complete without a reference to their predecessors in the remote ages.

Gynecology is singularly rich in illustrations of the belief that progress is in the direction of a circle rather than in that of a straight line—"that which hath been is, and that which is shall be;" and many of the brilliant discoveries with which it has been enriched in modern times, and even in America, were really but rediscoveries of discoveries which the mutations of time have effaced from the memories and the records of men.

While the current of gynecology as it has flowed down to us in an ever-widening stream from the past is traceable with definite clearness only to the Greeks, there is evidence that it did not have its origin among that remarkable people, but that it trickled in rivulets, too small for the attention of the great majority of explorers, from the people living on the Nile. That the stream was clearly recognized in the days of Homer and Herodotus is attested in the writings of those immortal

Greeks, who wrote in terms of the highest admiration of the skill and the learning of the physicians of Egypt.

The physicians under the Ptolemies were required to regulate their practice according to certain books, one of which was devoted to diseases peculiar to women. These books were held as sacred, and their authority was thus unquestionable. Doubtless, there existed among a people, evidences of whose greatness have of more recent years been so abundantly revealed, other works on this subject, but Saracen fanaticism in the destruction of the Alexandrian Library with its 600,000 volumes blotted out the story of what Egypt once was, and has left us only to conjecture. When the difference in the language and political complexion of Greece and Egypt is considered in connection with the necessarily limited intercommunication of the two peoples, it is but reasonable to suppose that comparatively little of the learning of the older civilization found its way to Greece, and that such inkling as we have received through the Greeks of the status of Egyptian medicine is very meagre when compared with the actual advancement which obtained.

The destruction of the Alexandrian Library has left the writings of Hippocrates, written about 450 B. C., the oldest extant containing anything like a systematic consideration of the diseases of women. Moses, who was versed in "all the learning of the Egyptians," shows a remarkable familiarity with the sexual peculiarities of women, but he treats of them in their physiology, and interests himself in the hygiene of the genitalia rather than in their diseases.

In the language of Adams, the learned commentator on the works of Hippocrates, "these works furnish the most indubitable proofs that the obstetric art had been cultivated with most extraordinary ability at an early period." In regard to gynecology proper, these works are, however, disappointing to him who has been led to admire and revere the philosopher of Cos through a study of his works on general medicine. Hippocrates advised the use of aromatic fumigations in amenorrhœa, which fumigations he also recommended as a test of fertility in the female. The woman who did not conceive was wrapped in blankets and fumigated from beneath; if the scent passed through her body to the nostrils and mouth, then it was known that she was not unfruitful! While he recognized a causative relation between the uterus and hysteria, he maintained that the movement of the womb toward the head caused pain under the eyes and nose, with abundant and frothy saliva; if it moved toward the hypochondrium, it caused vomiting of an acrid, burning matter; if it moved toward the liver, it caused loss of speech, clenching of the teeth, and a livid skin. The remedies for these various hysterical symptoms were as ludicrous as their etiology. Nulliparæ were held to be more subject to menstrual disorders than women who had borne children, for the veins of the woman who has given birth to a

child carry off the menstrual discharge more readily, because the lochial discharge improves the circulation. The views of the "Father of Medicine" on the treatment of uterine hemorrhage were, however, more sensible. We discover, indeed, in them some of the fundamental principles of the advanced methods of our own day. His knowledge of the relation of sympathy between the uterus and the mammæ is apparent in his instruction to apply a large cupping instrument to the breast as a means of staying uterine hemorrhage. His description of leucorrhœa and the frequent attendant systemic condition is graphic, although his therapy of the affection is crude. The prolapsed uterus, he says, "hangs down like a scrotum." It should be well washed with astringent lotions and restored to its place, when the woman must be placed on her back with her legs crossed and tied together. That Hippocrates recognized the fact that a molar pregnancy occurring in an unmarried woman impeached her virtue is evident from his statement that moles are caused by a superabundance of menstrual blood, together with a bad condition of the semen. He gives a clear differential diagnosis between molar and true pregnancy. His description of cancer of the uterus is clear, and his gloomy prognosis in such cases has not been much brightened by the advances made since his day. We recognize in the "phimus" of his day the modern stenosis of the os. He recommends an application containing verdigris for its relief. His remarks on atresia of the vagina and uterus command attention: "Sometimes the vagina becomes obstructed after parturition. I have seen a case where the parts were torn during delivery, causing excoriations, after which the parts became seriously inflamed, so that the lips touched and became united as in wounds. After the subsidence of the inflammation the lips, which had reunited, offered an obstacle to the menstrual discharge, preventing its free exit. It is necessary in such a case to dress the lacerated parts and cause cicatrization, but it is also necessary that the cicatrix be firm and complete, while it is very difficult to secure this result. In the instance of which I speak all the results took place which occur when the menses are suppressed by malformation of the uterus, but the principal pain was felt in the vagina, which the woman found to be occluded. After suitable treatment the menstrual flow was re-established, the woman recovered her health, and afterward bore children. If the case had been neglected, the wound would have increased in size, and a cancer would have been the final result." It is evident that the subject of sterility received much of his attention, and his views concerning the causation of the same are interesting. He held the cause to be one or several of the following: "1. Because the os uteri is turned obliquely from the passage to it. 2. Because the inside of the uterus, being smooth, either naturally or in consequence of cicatrices and ulcers, does not retain the semen.

3. When, owing to the suppression of the menses, any obstruction takes place in the os uteri, it is apt to prevent impregnation. 4. When impregnation does not take place, the veins of the uterus become so engorged with blood that they do not retain the semen; or, on the contrary, the same effect may arise from profuse menstruation, whereby the retentive faculty of the vessels is weakened and a return of the menstrual fluid in too great quantity may wash away the semen. 5. Prolapsus uteri, by rendering the mouth of the uterus hard and callous, prevents impregnation."

Among the Romans there is evidence that the diseases of woman received especial attention. Their knowledge was, however, mainly derived from Greece and Alexandria, their writings revealing none of the originality of thought and boldness of procedure which have always marked progress in this division of medicine. Celsus was a voluminous writer, but it is to be regretted that so much of such parts of his works as treated especially of the diseases of women have been lost as to leave us at best a very disjointed reference to the subject. Enough has, however, been preserved of his writings and of those of Galen to convince us that as early as the first century of the Christian era the speculum, rediscovered by Récamier in 1816, was not unknown; that the vaginal touch was used as a means of diagnosis; and that ulceration of the womb and leucorrhœa in its several varieties had been recognized. In the excavations of Pompeii and Herculaneum, overwhelmed with lava from Mount Vesuvius A. D. 79, and remaining buried for nearly eighteen hundred years, there were found among, other surgical instruments, two specula, such as were probably in common use at the time of the catastrophe.

Following the faint glimmer of light emitted from Rome, we have a period of almost absolute darkness extending over five hundred years, all of such history of the medicine of those years as may have been written having at last become extinct. At the end of this period we find at work in the library at Alexandria one Ætius, a Greek, whom the fame of that wonderful collection had probably attracted from his native land, although the fact that he refers occasionally in his writings to cases occurring under his own eye gives color to the belief that, besides delving in the accumulated lore, he also engaged in the practice of his profession. The writings of Ætius, compilations chiefly from the Alexandrian collection, having fortunately been preserved, we are permitted to know through them something of the status of medicine in Egypt a millennium and a half ago. A study of these writings will open up a wonderful revelation to those who regard gynecology as peculiarly a development of these later times. They consist of four books (*tetrabiblus*), each of which is in turn subdivided into many chapters. The fourth discourse of the

fourth book, containing one hundred and twelve chapters varying in length from a few lines to several pages, is principally devoted to obstetrics and diseases of women. In it the uterus and the ovaries, their structure and function, are described with a degree of exactness which both disposes of the assumption that the ancients were ignorant of physiology, and proves that they possessed instruments for ocular examination of the uterus (their dioptra) and sounds for determining its size in the living subject. The description, too, which is given of the methods in vogue for preventing the legitimate consequences of sexual congress and for inducing abortion proves that the nefarious practices by means of which the female of our day would accomplish the same result are not of modern origin. Latero-version, anteversion, and retroversion of the uterus, and various methods for the relief of these displacements, are discussed, and mention is even made of the sound for correcting malpositions of that organ. Abscess of the uterus was recognized, and the description of the examination for its diagnosis and the methods for its treatment would, barring certain crudities of expression, pass muster even in the light of our more advanced knowledge of uterine ailments and the means of their relief. The treatment, medical and surgical, laid down for pelvic abscess would do no discredit to the modern gynecologist. The relief of stenosis of the os by means of sponge tents is so graphically described as either to compel the belief that the modern discoverer of this use of these devices derived his knowledge from the writings of Ætius, or to cause the reader to marvel at the remarkable coincidence. Atresia of the vagina is discussed, and the operation, with instruments therefor, for its relief clearly described.

The next writer in chronological order whose writings are preserved to us is Paul of Ægina, between whom and Ætius there intervenes a century. This writer has been accorded a prominence which he does not merit. Dr. Adams, the translator of the Sydenham series, has shown him much consideration. A study of his writings in connection with those of Ætius reveal him to have been a plagiarist. He was at most a compiler, and his efforts even in this direction fell far short of those of the industrious and able Ætius.

Following Paulus Ægineta we have a millennium of darkness, the gloom being relieved only by the uncertain glints with which the Saracens sought to make amends for their damnable vandalism in the matter of the Alexandrian Library. But an insuperable obstacle to their progress in the knowledge of the diseases of women presented itself in the Moslem religion, which forbade visual and digital examination of the female genitalia, even under conditions of the most intolerable suffering, by male physicians. The ability of the Saracen physicians, so abundantly illustrated in other departments of medicine, was

therefore forbidden an opportunity of manifesting itself in this, and such knowledge as formed the basis of their unsatisfactory practice in gynecology was derived solely from the writings of the Greeks; and the fact that any treatment of a local nature which might have been deemed necessary must be applied by ignorant midwives caused this branch of medicine to soon fall into desuetude and consequent decay. Of the Arabian writers, Albucasis, in the fourteenth century, alone seems to have given it any considerable attention, and there is internal evidence in his writings that he was a Jew, and was thus not hindered by any religious scruples of his own from pursuing his studies after the manner proscribed by the Moslem religion. He makes an occasional allusion to the speculum, but doubtless the circumstances under which he lived made even his employment of it rare. Although it is apparent from the writings of subsequent authors, and notably Ambrose Paré (1509–90) and Scultetus (1683), that the instrument was not absolutely forgotten, it is nevertheless a fact that for a thousand years prior to its rediscovery (if such it really was) by Récamier (1816) it was practically a lost instrument, and gynecology certainly was during this millennium a lost art.

While, as intimated at the outset, American gynecology, dating from the earliest attention to this branch of medicine by the profession of this country, is continuous with gynecology as we have traced it in outline from its earliest dawn in the Old World, its achievements prior to the renaissance ushered in by Récamier cannot be said to have been of sufficient importance to entitle it to a distinctive national name. It must not be inferred from this that this division of medicine was more neglected on this side the Atlantic than on the other, or that the American woman whose means forbade a visit to the European centres was obliged to suffer from her ailments without having held out to her by native talent as much hope as could be promised abroad. While it may have been true, as charged by Dr. Douglass, that there was in his day (1717) "more danger from the physicians of Boston than from the distemper," this condition of affairs had much improved when the War of Independence was declared. The writings of Joseph Osgood of Andover and Joseph Orne and Augustus Holyoke of Salem evince a knowledge of the diseases of women which was probably quite abreast of that possessed by their European contemporaries. In the year 1790, nine years after its organization, the Medical Society of Massachusetts first published such of the contributions as were presented before that body. Among these publications is found an occasional article on some gynecological subject, but the first which was devoted to a subject unconnected with the puerperal condition was one entitled "The History of a Hemorrhage from a Rupture on the Inside of the Left Labium Pudendi." This was contributed by Dr. Nathaniel W. Appleton of

Boston, and appears in the second part of the first volume of the *Transactions* of the society, issued in the year 1806.

The influence of the teachings of Smellie and Hunter very naturally extended to the profession in the colonies, and abundant evidence of it is found in the reports of cases in such literature of the colonial days as is extant. The causes, however, which operated to the repression of progress in gynecology were operative here as in Europe; and while we believe that the latent energies of the profession of the New World, necessarily thrown quite entirely on its own resources, must in course of time have transcended in their results the achievements of the profession abroad, the struggle inaugurated by the Declaration of Independence diverted those energies into channels which were incompatible with scientific research. For seven long years the struggle for personal and national existence not only forbade the development of the native resources, but it also shut the profession out from the influence of the mysterious awakening from the lethargy of centuries which was going on in Europe. Nor did the cessation of hostilities leave the road to professional progress free and unobstructed. The victory had been achieved, but at a cost of life and energy and treasure which caused a depression from which it required many years to rally. Although the profession of medicine, which has for its object the health of the people—the supreme law—is a very essential factor in national growth, there are other matters which are more immediately pressing in seasons of great national depression—agriculture, manufactures, commerce. For a couple of decades following the close of the war these were held to be of paramount concern, and it was not until the opening of the present century that the profession of this country found itself in a position to devote even a portion of its energies to the special development of any particular division of the whole field of medicine which commanded its attention.

It was a happy coincidence that the profession in America found itself sufficiently recovered from the distractions of war to permit of its placing itself in the line of the movement in gynecology inaugurated by Hunter in England, and stimulated to unprecedented activity by the revival of the speculum by Récamier in France. The comparative leisure and wealth which followed in the wake of the prosperity ensured by the elasticity of our people made it possible for the profession to embrace the opportunity, which, had it presented a decade sooner, would of necessity have been allowed to pass by unimproved. The dawn of the present century found our young men and many of our older practitioners repairing to the mother-country and to the various seats of learning in Europe, and drinking in the spirit of the revival, and bringing it back with them to these shores. Among these young men was one Ephraim McDowell, who was born in Virginia in 1771, and

who moved thence with his father and the rest of the family to settle in Kentucky in the year 1783. Young McDowell was accorded the educational advantages of that early day in that new country. His subsequent writings show that his literary acquirements were not of a much higher order than we could have expected under the unpropitious circumstances. After leaving school he studied medicine for two or three years with a Dr. Humphreys of Staunton, Virginia, a graduate of the University of Edinburgh. When we recall the contempt which the physician educated abroad entertained in those days for American educational institutions, we are not surprised at finding no evidence of McDowell's having attended any lectures in Philadelphia, then the only seat of medical education in this country. At his preceptor's dictation, doubtless, he went to Edinburgh, where during the sessions of 1793 and 1794 he attended lectures in the famous university, then in the zenith of its renown. Not fully satisfied, however, with the regular course of the university on the subject of surgery, he took a private course under Mr. John Bell, a surgeon noted alike for his enthusiasm, his eloquence, his skill, and his hold on the affections of his students. We have no evidence that McDowell ever graduated. Mr. Bell is said to have been an enthusiast on the subject of organic diseases of the ovaries, and to have even discussed the possibility of their successful removal, although never himself venturing to practically demonstrate this possibility. Doubtless, the young Kentuckian resolved while under the spell of his teacher's enthusiasm to undertake what that teacher's timidity, perhaps, kept him from attempting, and he returned to his Western home inspired with the high resolve. He settled in Danville in 1795. Although but twenty-four years of age, the fame of his sojourn at foreign seats of learning, and of the fact that he had studied under John Bell, whose reputation had long before crossed the seas, soon secured for him a large clientèle. Patients soon flocked from all parts of the South-west, and for hundreds of miles around he had the monopoly of the important operations. He had been in practice fourteen years when he was consulted by a Mrs. Crawford, who suffered from a large abdominal tumor which a careful examination convinced McDowell was ovarian. Here was the opportunity, and the man was equal to it. The teachings of Bell had fallen in fruitful soil, and the time of their fruition had arrived. Mrs. Crawford was no ordinary woman, and when McDowell declared to her that her only hope lay in the removal of her tumor, explaining to her the fact that such an operation had never before been undertaken, and admonishing her of the dangers which attended it, the brave woman placed herself unreservedly in the brave man's hands. The consultation was held at Mrs. Crawford's residence, sixty miles from Danville, and Dr. McDowell made it a condition of his operating that his patient come to his home

for the operation. The heroine travelled this distance on horseback, was operated on in December, 1809, she being then forty-seven years of age, and at the end of twenty-five days returned to her home, where she lived for thirty-two more years, during which she enjoyed for the most part excellent health, and died at length in the seventy-ninth year of her age. When we remember the facts that this first operation for the removal of an ovarian tumor was performed before the days of anæsthesia, and that Dr. McDowell had none of the advantages of the trained assistants and perfected instruments which are now deemed so essential to the success of this operation, the courage of the woman and the skill and intelligent daring of the surgeon combine to form a picture which is unique for its grandeur in the annals of surgery.

Dr. McDowell's delay in reporting this case of ovariotomy was in singular contrast with the more commendable practice of these later days. Instead of immediately giving a description of his wonderful case for the benefit of his contemporaries, he waited for seven years, during which time he successfully performed two other ovariotomies. His report of these three cases appeared in the October (1816) issue of the *Eclectic Repertory and Analytical Review*. It was a document remarkable for its brevity, that portion of it covering the case which has made his name immortal, and which demonstrated the practicability of a procedure which more than any other has lengthened the average of woman's life and diminished the sum of her sorrow, not occupying more space than a page the size of that on which this sketch appears. The incision was made about three inches from the musculus rectus abdominis on the left side, parallel to the fibres of this muscle, and nine inches in length and extending into the abdomen. The abdominal parietes were found to be very much contused, owing, it was supposed, to the tumor's resting on the horn of the saddle during the journey. A ligature was thrown around the Fallopian tube near the uterus, when the tumor was cut open, and "fifteen pounds of a dirty, gelatinous-looking substance" removed. The sac was afterward amputated at the ligature, and was found to weigh seven pounds and a half. As soon as the external opening was made the intestines rushed out on the table, and so completely was the abdomen filled by the tumor that they could not be replaced during the operation, which was terminated in about twenty-five minutes. The woman was then placed on her left side, so as to permit the blood to escape, after which the external opening was closed with the interrupted suture, leaving out at the lower end of the incision the ligature which surrounded the Fallopian tube. Between every two stitches was put a piece of adhesive plaster, which, by keeping the parts in contact, hastened the healing of the incision. The usual dressing was then applied, the patient put to bed, and placed on a strict antiphlogistic regimen. On visiting her five days after, Dr.

McDowell was astonished to find his patient engaged in making up her bed.

The other two cases occurred in negro women, and the space devoted to the consideration of both of them is less than that taken up by a description of the first operation. The whole report was loosely and carelessly constructed, and poorly calculated to inspire confidence in the author's literary and scientific attainments. Had McDowell been gifted with facility of expression the recognition of his operation would doubtless have been more prompt. At his death, in 1830, it had not yet been looked upon with favor, although he had himself performed it thirteen times in all, with at least eight successes. The report of the first three cases having been sent to Dr. Physick of Philadelphia, "the Father of American Surgery," and at that time the leader of the American profession, it failed to interest him, his opinion of the backwoods surgeon being, probably, largely influenced by the display of his literary ability. The report was also sent to the operator's old preceptor, John Bell, but, owing to that gentlemen's ill-health, he was at the time absent on the Continent, and as he died not long afterward at Rome, he never received it. The paper fell into the hands of Mr. Lizars of Edinburgh, by whom it was published in the *Edinburgh Medical and Surgical Journal* in 1824. Mr. Lizars, with the instinct of a true surgeon, detected its merit, and was the first to perform McDowell's operation in Great Britain. This recognition of the Kentucky surgeon by his eminent Edinburgh contemporary won for the prophet and his operation an honor in his own country which he had previously been denied.

Dr. McDowell when he operated on Mrs. Crawford had a reputation which was only local, or he was at least known within but comparatively circumscribed limits from his own home. His name did not appear on the list of the great surgeons of his day, and—such is one of the peculiarities of human nature—when it was discovered that his claims did not deserve the ridicule with which they were greeted even in quarters in which one would suppose they would at least have received respectful attention, if not indorsement, envy began to take the place of ridicule. Accordingly, efforts were soon made to rob him of the honor of his great accomplishment, and claims were set up for a number who were alleged to have previously performed the operation.

It is scarcely necessary in this place to review the nature of these claims or to discuss their validity. Suffice it to say that they were all carefully investigated by the late Dr. Samuel D. Gross, and by him pronounced untenable.

While the operation by McDowell marked an era in gynecology, two years before he performed it an American, Dr. John Stearns of Saratoga county, New York, had given to medicine the drug ergot, which was destined to become one of the most important agents in both

gynecology and midwifery. It is true the drug had long before been empirically employed by European midwives, but Dr. Stearns was the first to reclaim it from such unscientific use by discovering its *modus operandi*. The publication of his paper in the *New York Medical Repository* in 1807 at once gave the drug a place in the physician's armamentarium, and its judicious employment since then has been the means of relieving perhaps as large a percentage of woman's suffering as any one surgical procedure.

The next in chronological order to McDowell who undertook to remove an ovarian tumor in this country was Dr. Nathan Smith of Yale, who, it is claimed, was not at the time aware of McDowell's achievement. His first operation was performed on July 5, 1821, and was successful, the patient being able to walk about in three weeks.

On May 23, 1823, Dr. Alban G. Smith of Danville, Ky., successfully removed an ovarian tumor from a negress thirty years of age. Dr. Smith had made a previous but unsuccessful ovariotomy in 1818. Following this last successful case a number of unsuccessful attempts were made by other surgeons, who in cutting down to the tumor found the adhesions so extensive as to deter them from further attempt at removal of the growth.

The fourth successful ovariotomist of this country was Dr. David L. Rogers of New York, who performed the operation on September 24, 1829. The operation lasted two hours, and at the end of two weeks the patient was able to be up and about her room.

In November, 1830, Dr. J. C. Warren of Boston made an unsuccessful attempt at the removal of an ovarian tumor. In December, 1835, Dr. J. Billinger performed a successful operation, following which there are no records of any cases until 1843, when Dr. A. Dunlap had his first case, an unsuccessful one. In the same year Dr. J. L. Atlee successfully performed a double ovariotomy. In 1844, Dr. Washington L. Atlee, who did more than any other American surgeon to establish ovariotomy as a legitimate surgical procedure, had his first case, which terminated unsuccessfully. Dr. Atlee took a decided stand in favor of the legitimacy of the operation, and, although he encountered a number of unsuccessful cases, he faithfully reported them in detail as a guide to those who might be induced to study the operation with a view to removing from it the discoverable reasons for its mortality. He encountered violent opposition and much vituperation, but had the satisfaction of living to witness such a general recognition of ovariotomy as a legitimate surgical procedure that scarcely any surgeon felt deterred from performing it. In 1855 he published a synopsis of his first thirty cases, of which seventeen recovered and thirteen died. Such a percentage of recoveries from a disease in itself necessarily fatal silenced opposition to the operation, and from that time the number

of ovariotomists in this country has rapidly increased, even up to the present time, while the percentage of mortality attending the operation by competent operators has, under improved methods, antiseptic and mechanical, grown to be quite as small as that attending most other capital operations.

In 1853, Dr. Washington L. Atlee read before the American Medical Association a paper on fibrous tumors of the uterus which at once became a portion of the classic gynecological literature of this country. It dealt with such of these tumors as had heretofore been supposed to be inaccessible to the knife or not amenable to curative measures. The paper was based wholly on the author's own experience, and gave important information touching the classification and means of diagnosing these tumors, besides indicating a method of their treatment by enucleation. It divided them into—1, extra-uterine or surface tumors; 2, intra-uterine or cavity tumors; and 3, intramural tumors of the uterus. The value of ergot given internally as a remedy was strongly insisted on, and the use of that drug in the removal of these growths through absorption due to pressure from contraction of the non-striated muscular tissue has since been regarded as the most efficacious means of treating such growths as are inaccessible to the knife.

In 1856 there appeared the prize essay by Dr. George H. Lyman of Boston upon the *History and Statistics of Ovariotomy, and the Circumstances under which this Operation may be regarded Safe and Expedient.* Up to that date Dr. Lyman's monograph was, probably, the most complete of any that had appeared, being a complete and careful research of the ovariotomy statistics of all countries.

In the same year Dr. I. E. Taylor advocated a new operation for the cure of recto-vaginal fistula, reporting two cases in which he had successfully employed it. This operation consisted in the severing of the sphincter ani in such cases.

Some remarkable operations for the removal of the extra-uterine fœtus were performed in the early history of this country. In 1791, Dr. William Baynham of Virginia successfully removed the tumor by incision of the abdominal parietes. In 1799 he performed a similar operation, and with equally satisfactory results. In 1816, Dr. John King of South Carolina cut through the walls of the vagina and removed through the incision, by means of the forceps and abdominal pressure, a living child which had been carried through the full term of gestation in the abdominal cavity outside the uterus. The life of the mother was also saved. This case stands on record as one of the most remarkable ever encountered, and, being without precedent, does all the greater credit to the operator's judgment and resolution. In 1874, Dr. T. Gaillard Thomas incised the vaginal wall with the galvano-caustic knife and removed a three months' fœtus; and in 1875,

Dr. D. Hayes Agnew of Philadelphia reported a case of vaginal section performed by himself for the removal of an extra-uterine fœtus.

Simon's method of introducing the hand into the rectum for diagnostic and therapeutic purposes is not as new as many are disposed to believe. In 1806, Dr. Clark, an American, recorded the fact that he introduced his hand into the bowel, and, putting his finger into the mouth of an extra-uterine fœtus, made traction and delivered the head *per rectum*. The body and secundines were removed spontaneously some time after. On the next day the anus had contracted to its natural size, but on the third day it, as well as the perineum, began to slough. On the ninth day the parts had commenced to heal, but the fourchette was destroyed.

Although such records as are available show that American surgeons and general practitioners were quite as successful in their treatment of special diseases of the womb as were their contemporaries abroad, nearly half a century had gone by since McDowell's discovery before anything occurred on this side of the Atlantic of a nature calculated to direct special attention to American gynecology. But the native shrewdness of the American practitioner qualified him for such utilization of existing knowledge as made him the peer of his Transatlantic brother in this special direction. Not until the year 1852, however—if we except Meigs's discovery of cardiac thrombosis as a cause of sudden death in childbed, and Hodge's improvements in the construction of uterine pessaries—did any of the great Kentuckian's countrymen do aught worthy of giving them marked distinction in the direction of gynecology. Hodge's pessary was a very decided improvement on instruments heretofore constructed for a similar purpose, being based on more correct physiological principles than any of its predecessors. The description of the steps which more immediately preceded the discovery of this pessary is best given in Dr. Hodge's own words, as quoted in a commemorative address by Dr. Penrose of Philadelphia: "He had been contemplating for a long time the subject of new shapes for pessaries, and after many experiments had found nothing satisfactory. One evening while sitting alone in the room where the meetings of the medical faculty of the university were held his eyes rested on an upright steel support by the fireplace designed to hold the shovel and tongs. The shovel and tongs were kept in position by a steel hook, and as he surveyed the supporting curve of this hook the longed-for lumination came: the shape, apparently so paradoxical, revealed itself in the clear light and flickering volume of the burning grate, and the Hodge lever pessary was the result." This was in the year 1830. To him the profession is indebted for the origin and development of two ideas which are at this day considered among the most important facts in uterine pathology—namely, that the condition of the uterus characterized by

enlargement, displacement, congestion, hypersecretion, and tenderness is not inflammation, nor should it be treated as such—that sustaining the uterus, and thus affording an easy and natural means of overcoming congestion and its results, is a prime factor in their relief and cure.

In 1833, Dr. Walter Channing, professor of obstetrics at Harvard University, wrote an article on "Irritable Uterus." This was the first comprehensive monograph upon a purely gynecological subject in New England, besides being one of the most valuable contributions extant to this division of medicine.

In 1841, Dr. Gunning S. Bedford, one of the most graceful writers of any age, established the first clinic for diseases of women ever held on this side the Atlantic, in connection with his chair of obstetrics in the University Medical College of New York. In this year also Dr. Alonzo Clark of New York introduced his plan of treating peritonitis with large doses of opium. This plan involves the exhibition of the drug to the limit of profound narcotism. The amount of it which is tolerated by the patient is greatly in excess of that which he will bear in the physiological condition. It requires the close attention of the physician in order that the limit be not inadvertently exceeded.

In 1844, Dr. J. C. Nott of Mobile, Alabama, published a report of a case of the removal of a carious coccyx, which was followed by relief of a very aggravated coccygodynia.

During the year 1852 there appeared in the *American Journal of Medical Sciences* an article by an Alabama doctor which once more directed the eyes of the medical world to this country. If Récamier's resurrection of the speculum marked the rise of modern gynecology, this article caused it to take a stride unprecedented. Récamier's speculum had exposed the uterus, but it did so quite imperfectly, and was of little or no service in placing the vagina under surgical control. The writer of the paper referred to had solved the problem, and the surgical diseases of the approach to the womb became amenable to treatment, while affections of the womb itself ceased very largely to be the opprobria of the healing art. If McDowell's discovery "has added forty thousand years to the sum of human life," who can compute the sum of happiness to the mind and misery averted through this discovery by J. Marion Sims? The paper by him on vesico-vaginal fistula made his title of "Father of American Gynecology" indisputable, and the discovery which it recorded has made surgery of the uterus and vagina a wellnigh exact science. The discovery of the operation for the cure of a disease previously incurable was in itself a great achievement, but the discovery of a method of so distending the vagina by air as to render this operation and all other necessary operations on the vagina and womb possible was a greater achievement. Gynecology to-day would scarcely deserve the name of a separate branch of medicine but

for Sims's discovery. It has been appropriately said that "it has been to diseases of the womb what the printing-press is to civilization, what the compass is to the mariner, what steam is to navigation, what the telescope is to astronomy; and grander than the telescope, because it was the work of one man."

While the grand results to gynecology which the genius of Sims has evolved are the outcome of that careful study and constant effort which are the essentials to most of such results in science as are destined to live, the discovery of the fact which brought his mind in the line of work which made him famous was quite purely accidental. Singular as it may appear, his tastes were originally not for gynecological work: he was, indeed, quite averse to treating diseases of the female sexual apparatus, and even to the necessary means of examination for making a diagnosis of such affections. He had, after perhaps more than the usual share of vicissitudes and discouragements which beset the young practitioner, and extending through an unusual length of time, succeeded in gaining the confidence of the community in which he lived and in establishing a reputation as a general surgeon. He was one day called in consultation in a case of labor in which the head had been impacted for nearly three days. He delivered the woman quite readily with the forceps, and she rallied well from the operation. Five days later she was, however, discovered to have an extensive slough of the soft parts, and was discharging both urine and feces through the vagina. He had then been in practice ten years, and this was the first case of vesico-vaginal fistula which he had encountered. After consulting the literature on the subject, he was convinced of the very rebellious nature of the accident to treatment, and in spite of the importunities of the owner of the woman (who was a slave), he refused to undertake an operation for its relief. In one month from that time he was consulted in reference to a vesico-vaginal fistula existing in the case of another negro slave, and again, in about another month, a third case came under his notice. This unusual number of cases presenting within such a short time compelled his attention to the disease, and, as he had established a small hospital, the three cases were placed under his care in the hope that he might devise some means of relief. While perplexed with these cases he was one morning suddenly called to see a lady who had been thrown from her horse. After due examination he concluded that the distressing pain from which the woman suffered was caused by a dislocation of the uterus. Recalling a rule for the treatment of this accident which had been given him while a student, he placed the patient on her knees and elbows, and, introducing one finger into the rectum and another into the vagina, "pushed up and pulled down" according to directions. Finding that he could just reach the uterus with his index finger, which was not long enough to permit him

to exert any force on the organ, he introduced also the middle finger; and in his effort to push the uterus back turned his hand palm upward and then downward, when all at once he could feel neither the womb nor the walls of the vagina. Immediately the woman declared she was relieved. As she turned on her side there was a sudden explosion, as though of air escaping from the bowel. He was satisfied, however, that the air was not from this source, but was from the vagina, and concluded that his traction on the perineum had suddenly created a vacuum into which the air rushed and expanded the vagina to its fullest capacity. Fired with a new idea which had just been forced upon him, he hurried home in order to test it in the case of the unfortunates suffering from vesico-vaginal fistula in his hospital. On his way he had stopped and bought a large pewter spoon, which he bent so as to secure the necessary purchase for retracting the perineum, as he had discovered he had accidentally done in the case of the woman suffering from the dislocation of the womb. Selecting one of his patients, he placed her on a table in the genu-pectoral position, and, placing a student on each side, instructed them to lay hold of the nates and pull them open. Before he could get the bent spoon-handle into the vagina the air rushed in with a puffing noise, dilating the cavity to its fullest extent. On making further traction with the spoon he had revealed to him a sight which had never before been seen by any man. The fistula with its edges clearly defined was plainly visible; the wall of the vagina could be seen closing in every direction; the neck of the uterus was distinct and well defined, and even the secretions therefrom could be plainly seen.

He at once devised and had made for him the instruments which he considered to be necessary for closing up the fistula. Among these instruments was the duck-bill speculum, to which his name has been inseparably attached; and it is a singular fact that the original design of that instrument has never been altered. It took him three months to have the necessary instruments made, and the case which he selected for the operation was an unusually bad one, the whole base of the bladder being destroyed, leaving an opening between the vagina and that viscus at least two inches in diameter. This was in December, 1845, and before the discovery of anæsthesia. He succeeded in closing the fistula in about an hour's time. In order to prevent the urine from dripping through into the vagina, he placed a piece of sponge in the neck of the bladder, through which he ran a silk string which he hoped would act as a capillary tube that would serve to turn the course of the urine from the fistula. This latter device proved to be a very unfortunate one. At the end of five days the patient was very ill from what, in more recent times, has come to be known as blood-poisoning. On attempting to remove the sponge, he found that it had

become solidified with sabulous matter from the urine, and he had great difficulty in removing it. On examining the fistula, he found that it had disappeared with the exception of two small openings in the line of the union of its edges. Encouraged by this pronounced success in healing the opening, he was confident that the small remaining apertures could be closed by a subsequent operation; before performing which, however, he operated on another of his patients, using in this case a self-retaining catheter instead of the sponge. At the end of seven days he removed the sutures, but discovered that though the original fistula had been greatly changed in character, there still remained three little openings through which the urine escaped. In spite of the repeated operations, having operated some thirty times on one of the cases, extending through a period of three years, he found himself unable to effect a complete closure of the fistula in any case. He finally concluded that he should not perform another operation until he had discovered some method of trying the suture higher up in the body than he could reach. While lying in bed one night the idea occurred to him to run a perforated shot along the suture to the edge of the fistula, and when it was drawn tight to compress it with a pair of forceps, thus making the knot perfectly secure. Elated with this idea, he conducted further operations, but with scarcely any better success than heretofore. He was now convinced that the cause of the failure lay in the nature of the material employed for sutures—namely, silk thread—and his next object was to secure some substitute. Mattauer of Virginia had employed lead, and Sims had tried this material as a suture in his cases of vesico-vaginal fistula, and had failed. At this juncture, in walking from his house to his office one day, he picked up a little piece of wire. Taking this to a jeweller, it served as a pattern for some pure silver wire which he ordered. In the next operation the edges of the womb were denuded and brought together with four sutures of wire thus prepared, the suture being closed by means of the shot run upon the wire and pressed with the forceps when run sufficiently far up. In using silk sutures cystitis always resulted in the case of operations at the base of the bladder, the urethra being always swollen and the urine loaded with thick, ropy mucus. With the use of the silver suture there was a complete change in these conditions. After a week had passed the patient was removed from the bed and placed upon an operating-table, and with an anxious heart the result of the use of the wire suture was examined. There lay the suture apparatus just exactly as it had been placed, with no inflammation, no tumefaction, and perfect union of the fistula. At last the labors of three years had been crowned with success, and vesico-vaginal fistula was removed from the list of incurable affections. In the course of two weeks the remaining patients in the hospital were

operated on, and in every case the results were completely satisfactory.

While it is manifestly the duty of the historian to select for his narrative, without bias or favor, facts which he regards as the most indisputable, he ought not to be accused of exceeding his duty when he notices claims which, although not disposed to concede them, he may regard as entitled to respectful consideration. The name of Sims will live in the history of medicine as that of the father of American gynecology, but it is only just to state that the claims of priority for some at least of the achievements which have won him this proud title have been disputed. Among those who have contested these claims, his contemporary, Dr. Nathan Bozeman, has been prominent. He was associated with Sims in the early years of their practice, and became his successor at Montgomery, Alabama, on Sims's removal to New York. Unfortunately, a dispute as to the authorship of several of the devices, which have made the operation for vesico-vaginal fistula a success, developed in later years, and became tainted with a considerable degree of acrimony. With this dispute we have nothing to do, further than to state that while history will endorse Sims's right to all that he claims in connection with the discovery and perfection of the operation, it will not deny to Bozeman an important part in helping to establish the foundation on which American gynecology is erected. Dr. Bozeman subsequently followed Dr. Sims to New York. Among the discoveries with which his name will continue to be associated are his knee-chest support, his self-retaining speculum, his button sutures—instruments and methods now but little used; also his method of autoplasty by gradual approaches, and his operation for the cure of chronic cystitis through the establishment of a fistula leading into the vagina. This operation was also independently discovered in the same year by Dr. T. A. Emmet, who was the first to give it to the profession in 1868, Dr. Bozeman's paper not having been published until 1871.

Dr. Sims's achievements, on which what may be called American gynecology is founded, were wrought out in an obscure Southern town and while engaged in the commonplace duties of the country general practitioner. With no prestige of college connection, and none of the backing which is generally considered necessary to distinction in a specialty, he won for himself the proud distinction, "Father of American Gynecology." It was necessary, however, after having thus laid this essential foundation that it should become known to the profession. To this end Dr. Sims determined to repair to one of the medical centres, and this the precarious state of his health compelled him to do sooner than he would have otherwise done. Being the victim of a chronic diarrhœa, his complaint made it necessary for him in 1853 to remove from the scenes of his distinguished labors, and he

decided on New York as his future home. The story of his earlier years in that city furnishes us a singular illustration of the jealousy of the obscure practitioner on the part of the gentlemen connected with the medical schools. An apparently systematic effort was made to appropriate his work without credit, and the attempts of certain individuals in this direction reflect little credit on their memory. After encountering opposition and suffering discouragements to which even he, with all his enthusiasm and force of character, would have succumbed but for the support and cheer of an heroic wife, he was thrown in the way of a Mr. Henri L. Stuart, who, being a man of great influence in both the financial and social world, and becoming warmly interested in the object of Dr. Sims's ambition—namely, the establishment of a woman's hospital—entered heartily into the project. At Mr. Stuart's suggestion, Dr. Sims sent out notices to the general profession that he would, on a certain day in May, 1854, deliver a lecture in which he would call the attention of all who might attend to the work which he had done. In view of the treatment which he had received at the hands of the gentlemen on whom he had called personally, he was very much encouraged at the size of the audience which had responded to his invitation. In spite of his innate diffidence, he succeeded in not only interesting the meeting, but in arousing it to a very considerable degree of enthusiasm. The plan of establishing a woman's hospital was broached, and, largely through the influence of Mr. Stuart, the project found favor with the public, and many prominent ladies of the city became actively interested in the work. These ladies formed themselves into an association, and in 1855 the object of Dr. Sims's ambition was realized—the woman's hospital had become a fact. It received very little encouragement from the leaders; that is, the hospital-men. Dr. Sims was called by them a quack and a humbug, and the hospital was pronounced a fraud. But in spite of the formidable opposition from this source the work went on, the wards of the institution were opened to any doctor who cared to come, the operations were performed in the presence of leading medical men, and the profession generally was welcomed to the institution. The hospital was inaugurated on the 1st of May, 1855, at 83 Madison Avenue, shortly after which Dr. Sims associated with himself Dr. Thomas Addis Emmet, who was at that time a young man and unknown, but who has since won for himself a reputation in gynecology second only to that of Sims himself. The woman's hospital in 1857 secured a charter from the State, and has from that time been known as "The Woman's Hospital of the State of New York." This institution has been the most important factor in the progress of American gynecology. Here it was that a systematic method of treating the diseases peculiar to women was first adopted. Until Sims's connection with it gynecology

as a specialty was unknown, he being the first to give attention to it, to the exclusion of all affections not coming distinctively under its head. Under his direction the facilities afforded by the Woman's Hospital were utilized to the perfection of operations on the perineum, vagina, and uterus, which previous to his immortal discoveries had been unknown, but which, chiefly through the knowledge disseminated from that centre, are now daily performed by even general practitioners in all parts of the world, to the relief of untold suffering.

In 1861, Dr. Sims visited Europe. His reputation had preceded him, and his reception both by the profession and the public was in keeping, and he soon found himself with such a large clientèle, in nearly all of the European medical centres that he afterward devoted his time about equally between both sides of the Atlantic. In 1865 he published his *Clinical Notes on Uterine Surgery*, in which he embodied the results of his special work, describing the operations which he had devised and the improvements which he had made on the procedures hitherto in vogue. This work made a very profound impression on the professional mind, and it was soon translated into almost all modern tongues. It was, indeed, the most distinctive work on gynecology which had been published, and may be said to be the basis of the specialty of gynecology as it exists to-day. Written in a style calculated to carry conviction, it at once became the guide and gave impetus to gynecological study.

On Dr. Sims's retiracy from the Woman's Hospital in 1862, Dr. T. Addis Emmet became surgeon-in-chief, and under his charge the institution continued to grow both in popularity and usefulness. Following the impetus given by Sims to gynecology as a specialty, a number of American surgeons gave their attention exclusively to this branch of work, and among those who at an early date thus devoted themselves Thomas Addis Emmet, H. R. Storer, Nathan Bozeman, E. R. Peaslee, T. Gaillard Thomas, James P. White, W. H. Byford, William Goodell, and Robert Battey have attained marked distinction, and American gynecology bears the indelible marks of their labors. Some of these gentlemen are dead, and to write of them in terms of the enthusiasm which their valuable work naturally arouses in a contemporary who has closely watched their progress might be in keeping. It is, however, a delicate and very difficult task to write of the living, and it must remain for a future historian to express out of the fulness of his heart his estimate of those who, having done their life-work in this direction, are now in the sere and yellow leaf. A bare record of their work is all that is now permissible.

Dr. Emmet in 1859 withdrew from general practice, and has since devoted himself exclusively to gynecology. He has been a diligent worker in the field, and has contributed freely to medical periodicals

reports of the results he has achieved. The most notable of his contributions pertain to the subject of laceration of the cervix uteri, detailing the etiology of the affection, its symptoms, its effects on the constitution, and the operation for its relief. This operation is now distinctively known as "Emmet's operation." It was first described in 1869 in a paper read before the Medical Society of the County of New York, and published in the February number (1869) of the *American Journal of Obstetrics*. In 1874 he presented before the same society an article on lacerations of the cervix uteri as a frequent and unrecognized cause of disease. The writer, not wishing to anticipate the events of later years, must dismiss this subject here, but will allude to it at some length when writing of the occurrences of the last-mentioned year.

In 1854, Dr. E. R. Peaslee made a valuable contribution to the treatment of septicæmia following ovariotomy. His method consisted in the introduction of a tube into the peritoneal cavity, through which the serous sac was freely washed out. Experience with this new method has done much to remove the fear which was before entertained of interference with the peritoneal membrane. After the lapse of a third of a century this method still remains as the most reliable for the treatment of one of the gravest consequences to the operation for the removal of ovarian tumors. In one of Peaslee's cases, reported at the time of his introduction of this new method, intraperitoneal injections were kept up for fifty-nine days, and in another for seventy-eight days, recovery following in each case.

In 1856, Sims added another to his long list of brilliant achievements by publishing his operation for narrowing the vagina as a means of curing prolapsus of the uterus. This advice was not strictly original with him, although we have no evidence to show that he had imitated any of his predecessors. The operation had been performed in Europe many years previously, but had fallen into desuetude.

Dr. James P. White of Buffalo during the same year reported the successful reduction by taxis of an inverted uterus of eight days' standing: Dr. White was a pioneer in taking the position that chronic inversion of the uterus is, as a rule, *always reducible*. He is distinguished as the first successful operator in the country to reduce a *chronic* inverted uterus. E. Noeggerath in 1862 practised reduction of inverted uterus by digital compression of both horns; and in 1868, Dr. T. Addis Emmet reported that he had retained partial reposition of the organ by closing the os externum with silver sutures. By means of this operation the advance made at one sitting is not lost, and the case is thus all the better prepared for future effort.

In 1861, Sims described the disease known as vaginismus, and recommended, as a means for its relief, the removal of the remains of the hymen and the section of the tissues at the perineal extremity of the

ostium vaginæ. This affection had been previously known to European authorities, and forcible distension of the ostium vaginæ, together with alterative applications with a view to the modification of the local nervous hyperæsthesia, recommended for its relief. The operation proposed by Dr. Sims was, however, an advance on the latter.

Prior to 1862 but one case of pelvic hæmatocele had been published. In this year this subject was brought prominently to the notice of the profession by the appearance of three essays, written respectively by John Byrne of Brooklyn, Fordyce Barker and Emil Noeggerath of New York.

In 1866 appeared an excellent treatise on "Vesico-vaginal Fistula," by M. Schuppert of New Orleans. It contained the history and exhaustive summary of the operation, was illustrated, and embodied the extensive experience of a successful operator in this department of surgery.

Dr. Theophilus Parvin reported in 1867 a case of uretro-vaginal fistula in which he operated by turning the displaced distal extremity of the ureter into the bladder, and then closing the vaginal opening. The operation proved entirely successful, and was original with Dr. Parvin.

In 1869, H. R. Storer published a "Method of Exploring and Operating upon the Female Rectum by Eversion of the Anterior Rectal Wall by a Finger in the Vagina." Since then this "method" has been quite generally adopted by gynecologists in certain cases.

In the same year V. A. Taliaferro of Georgia published an essay on "Pathological Sympathies of the Uterus," which attracted some attention.

In 1869, Dr. Julius F. Miner of Buffalo recommended, as an improvement in the management of the pedicle after the removal of an ovarian tumor, the stripping off from the tumor the expansion of the pedicle instead of ligating and severing it. This mode of treating the pedicle was called by Miner "enucleating the pedicle." This method is applicable in many cases, and when it can be applied is much to be preferred to the ordinary methods of securing the pedicle by clamp or ligature.

In 1870, Dr. T. Gaillard Thomas of New York removed an ovarian cyst of the size of a large orange through an opening made through the vagina and the cul-de-sac of Douglas. This was the first time that this procedure had been deliberately adopted for this purpose. It has been successfully practised since by Dr. Davis of Pennsylvania, Dr. Gilmour of Alabama, Dr. Battey of Georgia, and others. In the same year an important contribution to the current gynecological literature appeared from the ready pen of H. R. Storer entitled "Anal Fissure in Women." In the same year appeared an article entitled "Sudden Enlargement of

Ovarian Cysts from Hemorrhage into them," by the late brilliant and lamented John S. Parry, who afterward (1876) wrote so learnedly and exhaustively on "Extra-uterine Pregnancy." Dr. F. D. Lente has made many valuable contributions to gynecological literature, his principal article being "Intra-uterine Medication" (1870), of which he was a prominent advocate. Lente's silver probe and platinum cup were devised for the purpose of applying fusible substances, more particularly nitrate of silver, to the uterine cavity. His method was a marked improvement upon many of the other modes of intra-uterine medication. It was considered very valuable when caustics were more freely and more frequently used within the cavity of the uterus than is customary at the present time.

In 1871, through the energetic efforts of Dr. A. Reeves Jackson, the Woman's Hospital of the State of Illinois was founded. For a number of years he was the surgeon-in-chief, but latterly a full staff of medical officers has been in charge. Dr. M. S. Buttles claims to have been the first (1871) to apply the actual cautery to the uterine cavity in the treatment of submucous fibroids, and to be, therefore, the originator of that operation.

In 1872, Dr. Robert Battey of Atlanta, Ga., reported a case of extirpation of the ovaries, the results of which justified him in recommending this operation for the relief of dysmenorrhœa due to imperfect ovulation and accompanied by an excessive menstrual molimen, the object of the operation being to establish at once the change of life, and thus prove an effectual remedy for diseases otherwise incurable and dependent upon ovarian irritation. He termed the operation "normal ovariotomy." This name is not strictly applicable, inasmuch as it implies a normal condition of the ovaries, and is thus nothing more or less than spaying—an operation which has been practised from time immemorial for the production of sterility. The important points connected with this subject are best described in Dr. Battey's own words: "I have operated in widely different circumstances. In one case the patient had amenorrhœa, convulsions, recurrent hæmatocele, repeated pelvic abscesses, incipient tuberculosis from pulmonary congestion, etc. Several of the cases passed under the head of ovarian neuralgia; several had intractable dysmenorrhœa with pelvic deposits of old lymph; one had ovarian insanity, etc. All had exhausted the available resources to no useful purpose. I operate upon no case that any other respectable medical man proposes to cure. In most of my cases the full results of the operation have not yet been developed. This is the work of many months, and sometimes two or three years are necessary to its full and perfect realization. In no case has the patient failed to realize such a degree of relief and benefit following the operation as to amply compensate her for the pains and dangers incident thereto, to say

nothing of the promise of full and ample recovery at the completion of the physiological change. In two of my cases this change has seemed to occur at once in all its completeness, but it is always my expectation that it will occur gradually, extending through two or even three years to its final completion. In my first case, now nearly three years ago, the restoration to health is eminently satisfactory. It is true that she is not absolutely and perfectly well, but she is fully relieved of the convulsions, the ovarian periodical congestions, the hæmatoceles, the pelvic abscesses, etc. for which I operated. I submit the question in all sincerity: If I confine myself to cases where life is in danger or where health and happiness are destroyed—cases which are utterly hopeless of other remedy this side of the grave—ought the profession to demand at my hands the restoration of these forlorn invalids to complete and absolute health in every particular?"

The operation was originally performed by Dr. Battey in most cases with the patient on the left side and by the aid of Sims's speculum. "The cervix was drawn down to the pubes by means of a strong hook, where it was held while Douglas's cul-de-sac was opened from the vagina by means of a pair of scissors. On reaching the ovary with the finger as a guide it was seized by forceps or tenaculum and drawn into the vagina. It was then separated by the écraseur, or, being secured by a silk ligature, it was cut off and the stump returned into the cavity, the opening being left to close gradually, so as to admit of drainage." Dr. Battey does not, however, confine himself to this method of operation, but removes the ovaries by abdominal section as well. Battey's operation has been successfully performed by a number of practitioners since his introduction of it, and a sufficient time has now elapsed to permit a just estimate of its merits; and there no longer remains any doubt as to the propriety of its performance in cases which have resisted all other means of treatment. The principal danger consists in its performance at the hands of unskilled persons, and in the improper selection of cases, which is very apt to occur in the practice of those of limited experience in the treatment of diseases peculiar to women. Dr. Sims's inferences from his experience in the performance of the operation are as follows, and they are generally endorsed by those qualified to pass an opinion: "1st. Remove both ovaries in every case; 2d. As a rule operate by abdominal section, because if the ovaries are bound down by adhesions it is possible to remove them entire, whereas by vaginal incision it is not possible; 3d. If we are sure that there has been no pelvic inflammation, no cellulitis, no hæmatocele, no adhesions of the ovaries to the neighboring parts, then the operation may be made through the vagina or otherwise." Dr. Goodell of Philadelphia formerly preferred the vaginal method, and if he found it impossible to remove the ovaries in that direction on account of adhesions or other causes, he

would resort to the abdominal section, leaving the vaginal incision for deep drainage. The timely warning of the experienced gynecologist who originated it must never be forgotten by those who essay the procedure. Dr. Emmet would limit the operation to the extirpation of both ovaries for the arrest of hemorrhage from a fibrous tumor and in cases of threatened insanity, epilepsy, or phthisis. For nervous disturbances which present more of the hysterical element he maintains that the operation should never be thought of. The operation, he thinks, may be more frequently necessary in the present generation than it ought to be in the future, since a large number of cases calling for it have, under injudicious management, been already rendered incurable by other means. He holds that in the future this ought not to be so, for our enlarged opportunities for acquiring skill in the treatment of uterine and ovarian diseases ought to enable us to raise our patients above the necessity of such a terrible ordeal. This operation has of late come into very general use, and has been performed by many operators both at home and abroad.

During the year 1873 was published the eminently practical treatise of Dr. D. Hayes Agnew of Philadelphia on "Laceration of the Female Perineum and Vesico-vaginal Fistula, History and Treatment." The profession is much indebted to this author for his earnest and valuable labors in the branches of surgery of which this volume treats.

In the year above mentioned was published by the Government a quarto volume entitled *A Report of the Columbia Hospital for Women.* This was written by Dr. J. H. Thompson, the surgeon-in-chief of the hospital. The book was very widely distributed throughout the country. It contains much valuable matter, but it encountered a great deal of adverse criticism on the part of medical editors and reviewers following its publication.

In 1873, Dr. John Ball of Brooklyn described a plan of treating constrictions and irregularities of the canal of the cervix uteri from flexions and versions by rapid dilatation by expanding instruments of steel. His method is to first evacuate the bowels very thoroughly, so as to prevent all effort in that direction for two or three days. The patient is then placed on her back with her hips near the edge of the bed and profoundly anæsthetized. A three-bladed, self-retaining speculum is introduced to bring the os uteri into full view. The os is then seized with a double-hook tenaculum and drawn toward the vulva, when an ample bougie, as large as the canal will admit, is introduced, and followed in rapid succession by others until the canal is dilated to admit of a No. 7, which represents the size of his dilator. With this instrument the cervix is stretched in every direction until it is enlarged sufficiently to admit of a No. 16 bougie. A hollow gum-elastic uterine pessary of that size is then introduced, and retained in position by a

stem secured outside of the vulva for about a week, in which time it will have done its work and is ready to be removed. The patient during this time is kept perfectly quiet, usually upon her back, which is generally found to be the most comfortable position. Out of between twenty and thirty cases in which Dr. Ball had to resort to this procedure he has met with but one fatal issue. Lately, Dr. Goodell of Philadelphia has published a large number of cases operated on by forcible divulsion with very gratifying results. The method has come into very general use.

Early in this year Emmet published an account of the cause of failure and a new mode of operating for complete laceration of the perineum. Heretofore, operators had not taken into account the fact that the muscular fibres of the sphincter retract more than the others. Consequently, only the external fibres were brought together, resulting often in entire or partial failure to restore the retentive powers of the anus, and frequently, while the external parts would be united and the operator thought he had been successful, it was common to find that a fistula resulted. By diagrams and descriptions he showed in his written articles the manner in which the denudation must be made and sutures placed in order to secure apposition of the inner as well as the outer fibres of the sphincter: "If we examine carefully the extremities of the lacerated muscle, we shall find a slight pit or depression at each end which has been caused by contraction of a portion of its fibres. At the commencement of the operation a portion of the tissues at this point must be seized with a tenaculum and removed with a pair of scissors, together with a narrow strip entirely around the laceration to the opposite end of the muscle. After the edges of the muscles have been properly denuded the most important part of the operation is to introduce the first suture in its proper relation to the edges of the divided muscle. The manner in which these sutures should be introduced can only be shown by diagrams, and is not essential in this connection. These sutures are so adjusted that the divided edges of the sphincter are turned up and appear in perfect apposition."

But he also taught the profession the importance of adjusting the sutures in order to make this operation a success; and as a result of the teachings of this distinguished gynecologist his mode of operating in these cases has become generally known, and is now the common property of the profession. In his very latest writings he announces that he has but little to add as the result of further experience to the paper which was published during this year. He states that to unravel the cause of failure in this operation and to devise means of obviating it have occupied his attention for many years, and that they have cost him more thought than he has ever devoted to any other professional subject.

In 1873 also Dr. Thomas M. Drysdale of Philadelphia described a peculiar corpuscle as characteristic of ovarian fluid, and for a time it was believed that a perfect means of diagnosis of the existence of cystic ovarian tumors by microscopical examination of their contents could be determined; but while Dr. Drysdale seems to have been very successful in diagnosticating ovarian tumors, others have not been so successful. The late Dr. Atlee attached great importance to this method of Dr. Drysdale's, whose views upon this matter may be summed up in the following words: "I claim, then, that a granular cell has been discovered by me in ovarian fluid which differs in its behavior with acetic acid and ether from any other known granular cell found in the abdominal cavity, and which by means of these reagents can be readily recognized as the cell which has been described; and further, that by the use of the microscope and assisted by these tests we may distinguish the fluid removed from ovarian cysts from other abdominal dropsical fluids."

In this same year (1873) a paper which has been designated as a remarkable one, and which excited much adverse criticism, was published by Joseph R. Beck of Indiana, entitled "How did the Spermatozoa Enter the Uterus?" The patient of the doctor in whom sexual orgasm could be produced by digital examination was the subject upon whom his observations were made, which are reported as follows: "The cervix uteri had been firm, hard, and generally in a normal condition, with the os closed so as not to admit the uterine probe without difficulty; but immediately the os opened to the extent of fully an inch, made five or six successive gasps, drawing the external os into the cervix each time powerfully, and at the same time becoming quite soft to the touch. All these phenomena occurred within the space of twelve seconds' time certainly, and in an instant all was as before—the os was closed, the cervix hardened, and the relation of the parts had become as before the orgasm." According to Flint, Jr., Sitzmann of Germany published similar observations in 1846.

In 1874 one of the most important contributions to the pathology and treatment of diseases of the neck of the uterus was published by Dr. T. Addis Emmet. It had long been known that childbirth caused lacerations of the muscular portion of the neck of the uterus, but previous to his description no one had seemed to recognize how uniformly such lacerations had been confounded with so-called ulceration of the neck of the uterus, or how commonly the ectropion at the neck of the lip resulting from such tears had been mistaken for hypertrophy of the tissues. Emmet, recognizing these conditions, began to devise some method for their cure, and he advocated for this condition the paring of the edges of the ulcerated part and the bringing of them together by means of sutures.

The mode of operating, as first laid down by Emmet, is to place the patient on the left side in the Sims position, and by means of a Sims speculum bring the parts into view. The first step is to bring the flaps together in apposition, and while they are lifted up by means of a double tenaculum in the hands of an assistant a uterine tourniquet is slipped over the cervix below the point of vaginal junction, and tightened, the object of this being to control hemorrhage during the operation. The surfaces of the laceration are then freshened either with scissors or scalpel, after which they are brought together by means of silver sutures. One of the essentials to the success of the operation consists in the complete removal of cicatricial or other adventitious tissue during the freshening of the parts.

Since the introduction of Emmet's operation and the publication by its author of the *technique* of the operation, other gynecologists have adopted different means to accomplish the same results. The uterine tourniquet is not deemed requisite to control hemorrhage, nor is it the universal custom to place the patient in either the left or right semi-prone position. It is no longer deemed a prerequisite to success that silver wire must be invariably used, or that no other speculum than Sims's will suffice. Hot water will control hemorrhage. The dorsal—or, more commonly, the exaggerated lithotomy position, or the position of Simon—is chosen by many. Silk, or catgut properly prepared, is more easily introduced than silver, and is less liable to cut tissues. The silkworm-gut suture is preferred by some. Some of those who have used Simon's speculum a number of times prefer it to Sims's. This procedure is now generally known as "Emmet's operation." It is the belief of most American gynecologists—in which the writer fully concurs—that this operation marks one of the greatest advances in modern gynecology. At the same time, it is an operation which is liable to many and great abuses. Owing to the fact that so many neurasthenic women, as well as those suffering from neuralgias from the imprisonment of nervules in the cicatricial tissue of the torn uterine neck, have been relieved by this operation, many superficial observers have resorted to it with such frequency as to often bring it into disrepute. Many of our foreign brethren have also attempted to ridicule the operation, but, in spite of all, the fact still remains that no one operation or procedure of equal importance for the relief of suffering women has been devised in the last quarter of a century.

In March of this same year (1874) Emmet, during an operation for a submucous fibroid tumor of the uterus, discovered the value of traction during enucleation in producing a denuded pedicle. His mode of operating was with scissors around the base of the tumor, and to his surprise the raw surface thus left seemed much smaller than the original base of the tumor. The value of traction was several years before

insisted upon by him, but not until March, 1874, was he able to demonstrate clearly that the attenuated pedicle was the effect of the traction, and not an accident. In a case operated upon at that time he was able to encircle the broad basis of the tumor with his fingers and feel the process of pedunculation going on, as strong contraction was produced by traction, the contraction beginning at the fundus and running down in an oblique direction. On this account the traction should be made as near the fundus as possible. In this case a base of three inches in diameter became a pedicle of the size of a common lead-pencil, and the point of attachment after removal was reduced to a small pit, thus leaving an almost infinitesimal surface, comparatively speaking, for the possible absorption of septic matter.

In the year 1874 there were two papers in the *Boston Medical Journal* upon pelvic drainage after ovariotomy, by Dr. Gilman Kimball of Lowell, Mass., a distinguished pioneer in ovariotomy. Dr. Montrose A. Pallen of New York published a description of the operation as a substitute for amputation of the neck of the uterus in certain forms of intravaginal elongation, which he termed vaginal cervi plasti.

In the same year Dr. Marion Sims contributed a valuable paper to the *New York Medical Journal* upon the enucleation of intra-uterine fibroids.

In this year also appeared a small work, written in a powerful style by Dr. Edward H. Clark of Boston, entitled *Sex in Education*. No work upon medical topics or any kindred subject in modern times succeeded better in attracting the attention of the people for whose benefit it was written to the influence of the habits of modern life on the sexual organs.

In 1875 a valuable and interesting paper appeared by Dr. J. R. Chadwick of Boston in the *American Journal of Obstetrics* upon injection of nutritious or cathartic fluid into the intestines through the abdominal walls by means of an aspirator needle when the stomach proves entirely intolerant.

In this year Dr. Noeggerath of New York published in the *American Journal of Obstetrics* an interesting paper upon "Vesico-vaginal and Vesico-rectal Touch—a New Method of Examining the Uterus and Appendages."

In the *Transactions* for 1875 of the American Medical Association is a paper by Dr. Byford of Chicago upon "The Treatment of Uterine Fibroids by Ergot." This method, for the purpose of causing atrophy of uterine fibroids, was first suggested by Hildebrandt, but Byford seems to have been the first to advocate the use of this remedy in sufficiently large doses to cause expulsion in addition to the atrophy.

In this same year was published a valuable and very interesting paper by Dr. H. F. Campbell of Georgia upon "Position, Pneumatic

Pressure, and Mechanical Appliance in Uterine Displacements." This gentleman has from time to time written several papers bearing upon the same subject. He advocated replacement of uteri, if posteriorly displaced, by the patient assuming the knee-chest position, and the introduction of a glass tube into the vagina while this position is maintained. This position, by favoring the gravitation of the viscera forward, together with the introduction of air into the vagina through the glass tube, will often effect reposition of the displaced organ.

In this same year an interesting paper was contributed to the *Richmond and Louisville Medical Journal* by Dr. Goodman of Louisville upon "Menstruation and the Law of Monthly Periodicity." Dr. Brickell of New Orleans contributed also an article upon "Rupture of the Perineum, with a Description of a New Operation."

In 1875, Alexander Skene of Brooklyn performed the operation of laparo-elytrotomy, with a result never before attained. The patient was a dwarf with a rachitic pelvis, who had been three times delivered—twice by premature delivery and once by craniotomy. In her fourth pregnancy Dr. Skene allowed it to advance to the full term, and then, after labor had begun, he performed the operation, saving the mother and a healthy child of ten pounds' weight. This operation might more properly be designated as one pertaining to obstetrics, and yet we cannot forbear alluding to it here. It is one that had attracted the attention of obstetricians in our own country and in Europe at different times, and had been essayed by Skene in 1874, but first by T. Gaillard Thomas in 1870, who states that he did it without a knowledge of the fact that he been anticipated in the procedure by Baudeloque. In Dr. Thomas's case the patient died in one hour, and the child, premature and imperfectly developed, also almost simultaneously.

The year 1876, being termed the "Centennial year," as it was the year in which this country celebrated its hundredth anniversary as an independent nation, was rich in gynecological work. It also marks the beginning of a very important epoch in American gynecology—namely, the formation of the American Gynecological Society. In response to a summons issued May 24th a number of gynecologists from various parts of the United States came together at the hall of the Academy of Medicine in the city of New York for the purpose of forming a society for the advancement of the special department of medicine in which they were chiefly interested. The meeting was called to order by Dr. Chadwick of Boston, who had taken the most active part in the formation of the society, and was organized by the election of Dr. E. R. Peaslee of New York as chairman and Dr. Chadwick as clerk. Remarks was made by Dr. Peaslee upon the importance of such a society, and by Dr. Chadwick, who said that "the call to which you have responded by your presence here to-day

was addressed to a limited number of recognized gynecologists after consultation with several of the prominent men of Boston, New York, Philadelphia, and the West. It was not intended to include all those whose labors in this field of medicine would fully entitle them to an honored place in our ranks, but simply to form a nucleus around which gynecologists of the country should cluster. It seems a most fitting tribute to our national greatness that those who have striven to advance the noble cause of humanity, of science, of art in any of their departments should take steps in this Centennial year to prosecute their labors in the coming century with renewed vigor and under more favorable circumstances." These remarks apply with more than common force to the branch of medicine in which America can justly claim to stand pre-eminent. There were at this inaugural meeting the following gentlemen: Drs. Fordyce Barker, E. R. Peaslee, T. A. Emmet, T. G. Thomas, J. M. Sims, I. E. Taylor, E. Noeggerath, W. T. Lusk, P. F. Mundé, of New York; John Byrne, A. J. C. Skene, of Brooklyn; A. D. Sinclair, G. H. Bixby, J. R. Chadwick, of Boston; W. Goodell of Philadelphia; J. D. Trask of Astoria, N. Y.; T. Parvin of Indianapolis; W. H. Byford of Chicago; and Ed. W. Jenks of Detroit, Mich.

Letters were read from Drs. D. H. Storer, C. E. Buckingham, G. H. Lyman, W. L. Richardson, of Boston; W. L. Atlee, R. A. F. Penrose, E. Wallace, A. H. Smith, T. M. Drysdale, J. V. Ingham, of Philadelphia; S. C. Busey of Washington; E. Van de Warker of Syracuse; J. P. White, of Buffalo; R. Battey, of Rome, Ga.; J. C. Reeve, of Dayton, O.; and G. J. Engelmann, of St. Louis. On motion these gentlemen were added to the list of Fellows, and were considered as founders of the society.

A committee consisting of Drs. Trask, Sinclair, Jenks, Noeggerath, and Lusk was appointed by the chair to nominate a list of officers for the first annual meeting. The following list of officers was reported, and the gentlemen unanimously elected: President, Fordyce Barker; Vice-Presidents, W. L. Atlee, W. H. Byford; Council, J. M. Sims, W. Goodell, T. Parvin, G. H. Lyman; Secretary, J. R. Chadwick; Treasurer, P. F. Mundé.

The first annual meeting of the society was held in the same place Sept. 13, 14, and 15, 1876, at which twenty-eight Fellows were present. This society has since its organization, although not numbering among its Fellows all of the able gynecologists of our country, really represented the progress of American gynecology. Its annual volumes of *Transactions* have shown the rapid progress made in this specialty, and have given evidence of much original work, and each year its list of Fellows has been augmented by the election of new members, and, although many of its founders have passed away, the character of the society's work has continued to be of the highest.

Dr. Lyman of Boston published a paper on the theory entitled "A Theory of the Cause of Menorrhagia," with a list of cases treated with success by dilatation, which reads substantially as follows: "Dilatation of the cervix for surgical and diagnostic purposes is an old procedure, but that it should be followed by arrest of hemorrhage, although observed by some, was not publicly noticed until 1869 by Dr. Sims." In 1876, Dr. Lyman of Boston reported a short list of cases in which he had used dilatation with success in menorrhagia, and advanced the following theory: "In menorrhagia there is constriction of the vessels at the internal os, giving rise to congestion of the tissues above: such constriction doubtless is due to some morbid condition beneath the mucous membrane. Hence this operation is beneficial, although the opening through the canal be apparently sufficiently large. Precaution is to be taken that the hemorrhage is not due to malignant disease, and that there is no cellulitis nor peritonitis."

In this same year a valuable paper was published by Dr. Skene on the principles of gynecology as applied to obstetrical operations. Although not wholly original or the first time that many of his theories were enunciated, it is well worthy of mention in a history of American gynecology. Dr. Skene advocated the use of Sims's speculum in performing craniotomy and in using the cephalotribe, perforation being recommended to precede the use of that instrument. The use of Sims's speculum also facilitates the carrying out of Thomas's method of replacing a prolapsed cord; also the introduction of Barnes's dilators. He also recommended the use of the speculum in applying the tampon for arrest of hemorrhage and in the use of the curette or the scoop in removing the ovum.

In 1876, also, Dr. Noeggerath of New York read a paper at the American Gynecological Society upon latent gonorrhœa, especially with regard to its influence on fertility in woman. This was his first paper in the English language upon the subject, as the one in 1872 was published in the German language in Bonn. This paper has given rise to much discussion, favorable and unfavorable, and frequent allusion to it has been made in home and foreign journals. The paper and the author's conclusions are certainly unique, and we cannot forbear to allude to the latter, which he summarizes as follows:

"1st. Gonorrhœa in the male, as well as in the female, persists for life in certain sections of the organs of generation, notwithstanding its apparent cure in many instances.

"2d. There is a form of gonorrhœa which may be called latent gonorrhœa, in the male as well as the female.

"3d. Latent gonorrhœa in the male, as well as in the female, may infect a healthy person either with acute gonorrhœa or gleet.

"4th. Latent gonorrhœa in the female, either the consequence of an

acute gonorrhœal invasion or not, if it passes from the latent into the apparent condition manifests itself as acute, chronic, recurrent perimetritis or ovaritis, or catarrh of certain sections of the genital organs.

"5th. Latent gonorrhœa in becoming apparent in the male does so by attacks of gleet or epididymitis.

"6th. About 90 per cent. of sterile women are married to husbands who have suffered from gonorrhœa, previously to or during married life."

In 1876, Dr. Jenks of Detroit published the result of his observations on the use of *Viburnum prunifolium* in the treatment of diseases of women. This remedy had a limited use for some years as a preventive of abortion, it having been first introduced by Dr. Phares of Mississippi. The writer advocated the use of this remedy in all forms of dysmenorrhœa attended with profuse menstruation. It is not sufficiently sedative, if given alone, to fully relieve the sufferings of spasmodic dysmenorrhœa. It is, however, a valuable adjuvant to sedative and antispasmodic remedies. In dysmenorrhœa with menorrhagia caused by fibroid growths viburnum, in combination with ergot, has proved much more valuable than either remedy given without the other. The writer gave, as a general statement concerning the uses of viburnum, "that it is serviceable in all uterine disorders characterized by loss of blood." Since Dr. Jenks's paper was published the remedy has come into more general use, and the results have shown that too much was not said in its praise.

In this year also the first ten cases of Battey's operation by Dr. Battey were published, the following results being claimed for the operation in the cases reported: Complete relief, 3; temporary relief, 2; life prolonged, 1; no benefit, 2; death, 2.

In the same year there was published by Henry C. Lea of Philadelphia a small volume entitled *A Century of American Medicine*, Dr. T. G. Thomas contributing the chapter on obstetrics and gynecology. No one except those who have had occasion to search through the volumes and periodicals for historical matter can fully appreciate the labor which such an able paper must have cost its author. It contains a summary of everything of importance that had been previously done in these departments by the profession of this country.

In 1877 a paper was published by Dr. Brickell of New Orleans on the diagnosis and treatment of pelvic effusions. Three cases are reported by Dr. George H. Bixby, one by Dr. Byford, treated by aspiration either through the abdominal walls or *per vaginam*, the latter site being preferred. The history of these cases is valuable as showing the progress in the diagnosis of pelvic effusions and the relief afforded by this mode of treatment. Dr. Brickell considers the removal of a collection of serum in the cellular tissue as necessary as the removal of a collection of pus.

A paper was read before the American Gynecological Society by Dr. Goodell on the subject of vaginal ovariotomy. This operation was first performed by Washington L. Atlee, but the first premeditated vaginal ovariotomy was, as previously stated, performed by Dr. T. G. Thomas in 1870. Dr. Goodell, in discussing the subject, concludes that while this operation can never rival the ordinary operation, it is preferable in rare cases—namely, where a small polycyst lodges in Douglas's pouch or an unadherent monocyst protrudes into the pelvic cavity. The difficulties met with in this operation are from prolapsus of the intestines and unforeseen adhesions. In this same year Dr. Paul F. Mundé made a valuable report on the treatment of ovarian tumors by electrolysis. Dr. Von Ehrenstein claims to be the originator of this method, and, although this claim is disputed, he has at least had a larger experience than any other in its use. It was brought more prominently into notice by an announcement in 1875 of Dr. Semelleder of Mexico. Dr. Mundé, from his own experience and that of others, draws the following conclusions regarding the operation: That this method is most apt to be beneficial in cases where the tumor is monocystic, and yet so small as not to demand the radical operation; or a polycyst with thin walls and fluid contents, and absence of large and solid masses; or a large unilocular or multilocular tumor, in which adhesions are so extensive as to render ovariotomy dangerous.

Although it has long been known that mental aberrations may be caused by the sexual disturbance occurring at the time of puberty, menopause, during pregnancy, the puerperal state, and lactation, the idea of connecting this abnormal mental state with disease of a non-gravid uterus is modern. The first in this country to call attention to the causative relations of uterine and ovarian disease to mental disturbances in women were Dr. Fordyce Barker of New York and Dr. H. R. Storer of Boston. The former published an article upon this subject in 1872, and the latter a monograph upon the same subject in 1871, while both had promulgated their ideas by lectures some years previously.

In 1877, Dr. George J. Engelmann made a valuable collection of facts concerning hystero-neurosis. These show that neuroses of the brain, pharynx, larynx, eye, stomach, intestines, bronchii, and joints of severe and misleading character are frequently produced by non-development or disease of the uterus or ovaries, or both, or by peri-uterine disease. That the apparent disease of the organs named was a neurosis was proved by its disappearance upon removal of the abnormal condition of the uterus.

In 1878 there appeared a paper on the causes of vesico-vaginal fistula by Dr. T. A. Emmet, in which he exonerated the forceps from the charge that has been laid to them of frequently causing such lesions,

and attributed the frequency of fistula rather to delay in delivery and the neglect to use the catheter before instrumental delivery.

In this same year appeared in the *New York Medical Journal* a very valuable contribution from the facile pen of Dr. T. G. Thomas on the most effectual method for controlling the high temperature occurring during ovariotomy. Dr. Thomas's method is as follows: Upon a Kibbee fever-cot a folded blanket is laid, so as to protect the patient's body from cutting by the cords of the netting. At one end is placed a pillow covered with india-rubber cloth, and a folded sheet is laid across the middle of the cot to about two-thirds of its extent. Upon this the patient is now laid: her clothing is lifted up to the armpits and the body enveloped by the folded sheet, which extends from the axillæ to a little below the trochanters. The legs are covered by flannel drawers and the feet by warm woollen stockings, and against the soles of the latter bottles of warm water are applied. Two blankets are then placed over the patient and the application of water is made. Turning the blankets down below the pelvis, the physician now takes a large pitcher of water at from 70° to 80° F., and pours it gently over the sheet. This it saturates, and, percolating the network of the cot, it is caught by the india-rubber cloth beneath, and, running down the gutter formed by this, is received in a tub placed at its extremity for that purpose. Water at a higher or lower temperature than this may be used. As a rule, it is better to begin with a high temperature, 85° to 90°, and gradually diminish it. The patient now lies in a thoroughly soaked sheet with warm bottles to her feet, and is covered up carefully with dry blankets. Neither the portion of the thorax above the shoulders nor the inferior extremities are wet at all. The water is applied only to the trunk. The first effect of the affusion is to elevate the temperature, but the next, when the application is practised for an hour, usually brings it down. The water collected in the tub at the foot of the bed, having passed over the body, is usually eight or ten degrees warmer than when poured from the pitcher. This mode of procedure has been modified by others, but still it is to Dr. Thomas that we are indebted for this effective means of reducing the temperature.

In this same year Dr. E. Van de Warker of Syracuse, N. Y., contributed a valuable paper containing some original opinions upon the treatment of adhesions and indurations. The objects of treatment in this case are—1st, to allay pain; 2d, to produce absorption. For the first object anodynes—namely, opium or opium combined with *Viburnum prunifolium*—are valuable. More important, however, though acting less quickly, are rest, postural treatment, hot fomentations, and an occasional blister. Swinging in a hammock admirably combines a soothing feeling, from the gentle motion, with relaxation of the abdominal muscles and elevation of the hips. The continuous current, ten

to sixteen cells, indirectly through the system and through the induration, is also important. The agents for producing absorption are less direct, but still more valuable—viz. the galvanic current directly through the mass, one electrode being placed in the vagina and one on the abdomen. The internal use of ammonium chloride markedly lessens the size of the mass, producing absorption, probably by its effect upon the portal circulation. Careful handling at a later stage not only hastens absorption, but also tends to reduce the tenderness. The best method is by bimanual manipulation, a gentle to-and-fro motion given the mass by rolling it between the hands, one of which is placed against the vaginal and the other against the abdominal side. If the mass is situated in the iliac fossa, then the bone affords sufficient internal support, and but one hand is used.

In 1878, Dr. Henry J. Bigelow of Boston reported a number of cases operated upon by a method which he had devised for crushing and removing the fragments of stone in the male bladder. He demonstrated that tolerance by the bladder of protracted manipulation is greater than heretofore recognized, and that the operation of lithotrity can be done at one sitting. The article of Dr. Bigelow is of great importance, and even more applicable to the female bladder when no cystitis or thickening exists.

In 1879, Dr. Edward W. Jenks of Detroit published, in the *American Journal of Obstetrics*, a paper upon perineorrhaphy, in which he described a method devised by himself for denuding the mucous surfaces with but little loss of blood. His method, given in his own words, is as follows:

"The patient being etherized, I begin by cutting with a scissors the anterior margin of surface to be denuded at the juncture of integument and mucous membrane. Next I introduce two fingers of the left hand into the rectum, while assistants hold the labia apart, it being important that they are held uniformly tense. I use scissors slightly curved and sharp-pointed to denude the mucous membrane. I use neither tenaculum nor tissue-forceps, but with the parts tense snip a hole in the mucous membrane in the median line close to the integument, and then, inserting the scissors with a cutting motion into the small hole made, I continue to dissect the mucous membrane away from adjacent tissues without removing the scissors, first going up the septum as far as desired, and then laterally, first on one side and then on the other, without removing the scissors or once bringing their points out from beneath the mucous membrane. Then with blunt-pointed scissors I cut away the dissected flaps. The advantages of this method are—*a*, the rapidity with which it can be done; *b*, the absence of hemorrhage in the vagina, as no blood escapes at the locality where the scissors enter beneath the mucous membrane; *c*, the ability with which the operator

can make complete denudation, as the discoloration beneath the mucous membrane marks the route the scissors have taken. This mode of operating is only applicable where there is redundancy of the tissues, and not where there has been great loss of substance, as in cases where the septum has been torn to any great extent."

The same author describes also in the same paper a new method of securing the sutures in the operation of kolpo-perineorrhaphy.

In this same year there was a valuable contribution on the subject of ovarian diseases made by Dr. Mundé, entitled "Prolapsus of the Ovaries." In this paper he gave points in diagnosis and modes of treatment. Mention, however, had been made of this subject in the *Journal of the Gynecological Society* of Boston in 1872 by Storer, Warner, and Blake. In this publication, covering the results of his observations, Mundé calls attention to the fact that uncongested ovaries may become prolapsed, and in turn prolapsus leads to congestion. He calls attention to points now well known, that many of these cases were undetected, and directs attention to the physical and mental derangements to which they lead. He also directs attention to the value of the genu-pectoral position and Sims's speculum as aids in their replacement. In the discussion which followed this paper, which was read before the American Gynecological Society, Dr. Barker recommended suppositories of iodide of lead if painting the vaginal roof with iodine produced too much irritation. Drs. Bozeman and Mundé had found iodoform useful in these cases for the relief of the hyperæsthesia. Dr. Albert H. Smith advised examination by rectum for diagnostic purposes, and Dr. Skene alluded to the pain during and after defecation as a diagnostic symptom. Dr. Taliaferro of Atlanta, Ga., was the first to suggest packing the vagina with cotton tampons to support prolapsed ovaries. In April, 1878, Dr. Taliaferro, in a paper read before the Medical Association of Georgia, advocated pressure by the tampon as a therapeutic in the treatment of uterine and periuterine diseases.

In 1880 a paper was written by Dr. Chadwick advocating the use of hot rectal douches in the treatment of pelvic inflammations.

At the meeting of the American Gynecological Society in 1880, C. D. Palmer of Cincinnati read a full and instructive paper entitled "Laparotomy and Laparo-hysterotomy, their Indication and Statistics for Fibroid Tumors of the Uterus."

In this year also a paper was read by Dr. A. Reeves Jackson of Chicago, at a meeting of the American Gynecological Society, on "Uterine Massage" as a means of treating certain forms of enlargement of the womb, which, although not wholly original with the writer, gave rise to some considerable discussion in home and foreign medical journals.

In 1881 an interesting paper was published by Dr. Van de Warker

in which he recommends forcible elongation of pelvic adhesions in cases where they cause pain during defecation or other straining efforts.

In this year Dr. Thomas published a paper upon "Laparotomy complicated by Expansion of the Bladder over the Surface of Abdominal Tumors, and its Attachment to them or to the Abdominal Walls." He made a collection of reports and cases, and offered the following mode of procedure: "As diagnosis even by the sound is difficult, if it is not impossible, this complication is not perceived until the abdominal incision is made or the bladder laid open. If it happens to be attached to the abdominal parietes, the bladder should be separated by digital detachment. If adhesion is too close, then incise the anterior wall of the bladder; if incision has not already been made, with two fingers in the bladder as a guide the adhesions can be cut. Then clamp the edges of incision between the lips of the abdominal wound, and close by silver sutures."

An interesting paper by Dr. William Goodell of Philadelphia was published on "Bursting Cysts of the Abdomen," in which the author alludes to the great difference, as far as danger is concerned, between parovarian and ovarian cysts, the contents of the former usually being limpid and innocuous, and the fluid eliminated frequently by the kidneys, intestines, or skin, and is usually rapidly taken out. In case of the bursting of ovarian cysts the danger is much greater. He alludes to a case seen by Dr. Sims in 1856 which burst three times, the fluid being eliminated by each of the three channels mentioned—one entirely by the kidneys, another entirely by the intestines, and the remaining one wholly by the skin.

In 1882, Dr. Emmet brought to the notice of the profession his new method of exploration and treatment of the urethra by the "buttonhole incision," as he designates it. He first essayed this method in 1879. It consists of a buttonhole incision in the urethra extending from near the meatus to a short distance from the neck of the bladder, the greatest length being on the vaginal mucous membrane. Retention is not impaired, and diagnosis and treatment are greatly facilitated. The special advantage of this method is the facility which it offers to the diagnosis and treatment of polypi or other growths about the neck of the bladder. After the cure is effected the opening is easily closed.

In this year Dr. J. C. Warren of Boston offered a new method of operation for laceration of the perineum involving the sphincter and rectal wall. The operation consists in dissecting a butterfly flap from the posterior vaginal wall above the rent, and a similar flap from above downward, leaving plenty of attachment around the entire edge of the ruptured rectal wall and sphincter. The flap is turned downward, covering the rectal rent. The freshened edges of the sphincter are brought together over the flap, which hangs out of the anus like a small hemor-

rhoid. All freshened surfaces are then brought in coaptation, the flap being laid in folds. The part hanging from the anus if not too long will draw up as cicatrization takes place.

In January of this year Dr. Christian Fenger of Chicago recorded the first successful operation of kolpo-hysterectomy for uterine cancer, at which time he also advocated the operation as a justifiable one. Dr. O. Stroinsky of Chicago in this year reported a novel operation for traumatic rupture of the bladder: while removing a fibroid polypus from the bladder by twisting he made a rent into the anterior wall, inverted the whole bladder through the dilated urethra, repaired the rent by three sutures, and replaced the bladder. The result was recovery.

In 1883, Dr. C. C. Lee read before the American Gynecological Society a paper on the injuries of the gravid uterus as a complication of laparotomy. From a study of a necessarily small collection of cases both at home and abroad, the first occurring in 1856, Dr. Lee concludes that—1st, the gravid uterus may be wounded without necessarily producing abortion; 2d, abortion seems to depend upon opening the ovisac; 3d, if the uterine contents are injured Cæsarean section is indicated, after which drainage may be maintained through the dilated cervix; 4th, if the uterine contents are uninjured, the wound is to be treated on general principles—namely, exact coaptation by carbolized sutures.

In this year, too, Emmet describes a new operation for so-called laceration of the perineum. It is considered particularly useful where there are large rectoceles. In this paper he holds that the loss of support following the laceration produced by childbirth is not due to the injury of the perineal body. In fact, he denies the existence of any such body, and claims that the injury is due rather to the detachment of perineal muscles and the perineal fascia. The description of this operation by the author is by no means lucid, but it substantially consists in a semilunar form of denudation, wholly within the vagina, of such extent that when the edges are brought together by means of sutures the "slack" in the posterior wall is entirely taken up or made to disappear, and yet the ostium vaginæ is in no way denuded or directly interfered with. The advantages claimed are—great diminution in the discomfort following immediately after the operation, and the perfect juxtaposition of the anterior and posterior vaginal walls, as in the non-parous woman.

In the *Transactions* of the American Gynecological Society for 1883 appears a paper by Dr. E. W. Jenks describing a new mode for operating for fistula in ano. In the same volume is a paper of Dr. Emmet's, in which he alludes to having performed the operation in the same manner, neither gentleman having been aware of the fact that the other

had performed the operation. Dr. Jenks's first operation was on March 31, 1881. The operation consists in incising the fistulous tracts after the usual method, dissecting out the so-called pyogenic membrane and all lardaceous and cartilaginous substances along the route of the fistula, and also cutting away all portions of thin livid skin of low vitality. The incised parts are maintained in perfect apposition by means of deep and superficial sutures until adhesion is effected.

In this year Dr. W. H. Byford published an interesting paper upon chronic abscesses of the pelvis, and the following points are made prominent: When the surface of a pelvic abscess is identical with that of an external ulcer, granulations may be exuberant or freely movable and flabby or firm and vigorous. When the granulations are exuberant, forming large projections into the abscess-cavity, its surfaces should be curetted. The same operation is also indicated when early suppuration takes place in pelvic hæmatoceles, in order to remove the clots which suppuration cannot dispose of. As granulations disappear and cicatrization takes place the contents of the abscess undergo changes. Serum exudes, macerating and finally disintegrating the pus-corpuscles and causing them to disappear. Osmosis going on through the cicatricial membrane converts the contents into simple serum. There then results an encysted tumor containing serum-like fluid.

It is believed that Dr. Charles K. Briddon was the first in the United States to perform laparotomy after rupture of the fœtal sac in tubal pregnancy. This he did in October, 1883.

Dr. Matthew D. Mann was the first to publish a successful operation, performed in February, 1883, in which he removed a small subperitoneal fibroid tumor of the uterus through the anterior wall of the vagina.

In this year an operation for the cure of retroversion of the uterus was described by J. B. Hunter of New York. Dr. O. E. Herrick of Michigan had also performed and reported the same operation, each gentleman working independently. The latter, however, it is believed, is entitled to the credit of being the first to perform the operation. The operation consists of a denuded surface upon the posterior lap of the uterus which is united by sutures to a similarly denuded surface upon the posterior vaginal wall.

In the January number of the *American Journal of Obstetrics* of this year Dr. Garrigues of New York published a paper upon laparo-elytrotomy. In this paper he alluded to the place of incision and the position of the ureters, and pointed out how they might be avoided during operations. Dr. Polk of New York had written upon the subject the previous year, and Dr. Garrigues had himself investigated it in 1878. Drs. Polk and Garrigues agree, from experiments made upon the cadaver, that in the operation of laparo-elytrotomy the ureter is safer from injury if it remains below rather than above the incision.

In November of this year Dr. B. Bernard Brown of Baltimore performed a new operation for the reduction of an inverted uterus. An incision was made in the fundus of the uterus, through which he passed one of Sims's large dilators up through the cervix, expanding the latter to the fullest extent. He then passed through hard-rubber dilators, and having assured himself, by means of the finger, that no adhesions existed, the incision of the fundus was sutured, and with some manipulation the fundus was easily pushed up through the now dilated cervix, and the operation was complete.

In 1884 a valuable paper was published by Dr. Palmer of Cincinnati, entitled "Abdominal Section, its Value and Range of Application as a Means of Exploration and Treatment." This paper was read before the American Gynecological Society, and gave rise to much valuable discussion. In this year an instructive paper by Dr. Thomas appeared, entitled "Management of the Placenta after Laparotomy in Abdominal Pregnancy at Full Term or Beyond."

An unique and interesting article from Dr. Isaac E. Taylor of New York was published upon physiognomy of the vulva following anal diseases. Dr. Taylor had made observations in this connection which may be considered as very useful in diagnosis. He directs attention to anal diseases causing changes in the appearance of the vulva as painful affections, coming under the head of—1st, spasmodic contractions of the anus; 2d, neuralgia or hysterical hyperæsthesia; 3d, irritability or indolent fissure in that locality.

An interesting article was published in the *American Journal of Obstetrics* of November, 1883, to March, 1884, by Dr. H. R. Bigelow, entitled "Gastrotomy for Myo-fibromata of the Uterus." It is one of the most valuable contributions to our knowledge of the subject up to that time. He alludes to the publication in 1853, by W. L. Atlee, of a paper entitled "Surgical Treatment of Certain Fibrous Tumors of the Uterus" as the beginning of a movement in the treatment of uterine fibroids. Until 1863 a few surgeons at home and abroad, like Atlee, Burnham, and Kimball, on opening the abdomen for ovarian tumors, having found a uterine tumor, ventured to remove it. Burnham made a supravaginal hysterectomy June 26, 1853, and the patient recovered. This was the first successful case in America. Afterward Koeberle of Strasburg was the first to deliberately open the abdomen for the purpose of removing uterine fibroids and fibrous cysts, which he did by ligature if pedunculated, or by the performance of hysterectomy if they were intramural or sessile. Dr. Storer was among the first in America to deliberately follow in his footsteps. Dr. Kimball of Lowell with equal boldness operated about the same time as Koeberle.

In writing of early operators Bigelow states that "Kimball and Koeberle seem to be the only ones whose operations were based upon a

correct diagnosis." The present status of such a treatment of myo-fibromata of the uterus was concisely set forth in this year by Dr. R. S. Sutton of Pittsburg in an article on "Non-malignant Tumors of the Uterus;" and several American writers on uterine fibroids give Dr. Goodell the credit of being the first in the United States to remove ovaries to prevent further growth in uterine fibroids, but the date of his operation we are unable to state.

Dr. H. A. Kelly of Philadelphia reports a successful operation for sessile cervical fibroids above the vaginal roof by abdominal incision. Free hemorrhage was checked by the use of Paquelin's cautery applied deep in the peritoneal cavity. The first successful case of laparotomy for pelvic abscess in this country was made by Dr. R. S. Sutton in June, 1884.

A very interesting address was made at the meeting of the American Gynecological Society in 1885 by Dr. Wm. T. Howard upon encysted tubercular peritonitis. He had collected from various sources six cases in which there was interference: one of these was aspirated, three tapped, two operated upon as in ovariotomy, and all died. One case was simply treated by hygienic and therapeutic measures, and recovered. Some of his clinical conclusions are that tubercular peritonitis appears in early life. Its development is rapid, varying from six weeks to eight months. Being rarely a local affection, we should search for indications of the disease in other parts of the body. A number have observed that a red blush of the central anterior part of the abdominal wall is characteristic of tubercular peritonitis.

At the meeting of the Gynecological Society of this year (1885) quite a lengthy discussion was held upon modifications of Emmet's operation upon the cervix uteri, called forth by a paper of Dr. Sutton's. The majority of the members participated in this discussion, and the fact was clearly demonstrated that the mechanical ingenuity of the different gynecologists is of the highest order.

Dr. Goodell reported this year having observed a form of parotitis following operations upon the female genital organs which was not of septic origin. That such diseases might occur is owing to the relationship which is known to exist between the sexual organs of the adult and the cervical and salivary glands. The inflammation observed by Goodell closely resembles mumps, and usually ends in resolution unattended with any of the signs of septicæmia, such as frequency of the pulse or glassy appearance of the eye. This variety of parotitis lasts longer than mumps. Instead of the patient failing as in septic inflammation, she gains *pari passu* with the continued enlargement of the glands. His first case was reported to the Obstetrical Society of Philadelphia in October, 1884.

In this same year Dr. Alfred C. Post of New York reported a new

form of operation for lacerated perineum, which may be briefly described as follows: An incision of half an inch in depth is made upon each side of the vagina in such a manner as to make upper and lower segments. The upper segments are turned up to form the floor of the vagina and secured by a row of catgut sutures passed through the subcutaneous tissues. A row of silver sutures is passed beneath the bottom of the incision. The lower edges are also united by fine sutures.

In the *New York Medical Journal* of this year Dr. John Scott of San Francisco reports a case of chronic pelvic abscess treated by abdominal incision. After the abscess-cavity was washed out a drainage-tube was passed through the incision into Douglas's cul-de-sac and through into the vagina. The abdominal incision was then closed; recovery.

In June of this year Dr. B. E. Hadra of San Antonio, Texas, read a paper before the section of Diseases of Women at the American Medical Association, entitled "Intraperitoneal Adhesions in Relation to Tait's Operation." He calls attention to the marked relief in some cases after Tait's operation in which disease of the tubes and ovaries was not extensive. This fact he considers due rather to the breaking up of adhesions—namely, of the intestines to the fundus or sides of the uterus; also extra-pelvic adhesions, especially adhesions between the omentum and parietal or visceral peritoneum. He advocates laparotomy for a new purpose—namely, to free the peritoneum throughout its entire area.

In a paper on vulvar and vaginal enterocele, read before the New York Academy of Medicine in 1885, Dr. T. G. Thomas advocated a new method of treatment for vaginal enterocele in cases not amenable to the ordinary measures—namely, laparotomy and dragging up the hernial sac and fastening it to the abdominal wound. He reports one case in which this plan was partially pursued with successful result.

In a series of articles in the *American Journal of Obstetrics* in 1885, entitled "Studies in Endometritis," Dr. Mary Putnam-Jacobi further develops the cyclical theory of menstruation which was first enunciated in 1878 by Dr. Goodman of Louisville. The theory which she sets forth is substantially as follows: The endometrium above the os internum, the mucosa of the Fallopian tubes, and the cortex of the ovaries are designated as the "*germinative membrane*." "The epithelium and subepithelial cells of this membrane are directly derived from the germinal epithelium of the embryonic hypoblast which covers the reproductive eminences of the pleuro-peritoneal cavity." . . . . "In all the elements of germinative membranes persists the embryonic property of indefinite growth." This process is changed from continuous to cyclical through the mechanical obstructions which are encountered after a certain point in growth is reached. Dr. Jacobi, like Dr. Good-

man, separates ovulation and menstruation as far as cause and effect are concerned. Ovulation and menstruation are usually synchronous. The former does not cause the latter, but both are produced by the same cause—namely, growth of embryonic tissue.

In 1885, Dr. Baird of Texas advocated a new method for the treatment of pelvic cellulitis for arresting exudation and pain, and applies the galvanic current. He reports a case also where pus had formed, which he evacuated by aspiration, and then injected the cavity with salt water, and applied a galvanic current to the cavity, with the result of speedy contraction of the abscess and radical cure.

In 1886, Dr. Sarah E. Post published in the *American Journal of the Medical Sciences* an exhaustive résumé upon the subject of kolpohysterectomy, which comprises a collection of all cases on record, with a short history and description of each of the various modes of operating.

Dr. H. Marion Sims of New York read this same year, before the New York Obstetrical Society, a paper on ventral hernia following ovariotomy, in which he advocates a radical operation for its cure. In a patient who suffered very much pain on account of the hernia, the hernial ring being ten inches in diameter, he excised an elliptical piece of skin, and then united the peritoneum by Lembert sutures. Then the muscles and fasciæ were united separately with catgut and silver wire. The result was a perfect recovery.

Dr. Polk of New York reported to the Obstetrical Society of New York a case of pelvic abscess which was operated upon *outside* of the peritoneum by means of an incision made as in that for ligating the iliac artery, the patient recovering.

January 20th of this year the first annual meeting of the Alumni Association of the Woman's Hospital of the State of New York, composed of former medical officers and house-surgeons, was held. A permanent organization was effected, and Dr. J. B. Hunter was chosen president. At this meeting many interesting papers were read and discussed, most of which have been published in medical journals; a history of the institution was also read, it being altogether a meeting of the alumni.

In mentioning the historical points heretofore the writer has aimed to pursue a chronological order, but there are some items relating to gynecological history which, being matters of development, can hardly be spoken of as pertaining wholly to any one year, and therefore will now be alluded to.

In this connection attention is directed to the use of electricity in the treatment of uterine fibroids. Among those who have investigated this subject and experimented and published their results may be mentioned Dr. J. N. Freeman of Brooklyn, Dr. Engelmann of St. Louis, Dr. Everett of Clyde, O., Dr. Martin of Chicago. These gentlemen

have written upon electrolysis in the treatment of subperitoneal and intramural fibroids. Drs. Thomas, Mundé, Vanderveer, and Semelleder of Mexico have experimented and written upon electrolysis in the treatment of ovarian tumors. Dr. Mundé gives a report of fifty-one cases which he has collected from various sources, of which there were nine deaths and fourteen failures, the remainder being benefited or cured.

In 1874, Dr. Gilman Kimball published in the *Boston Medical Journal* a paper entitled "Treatment of Uterine Fibroids by Electrolysis or Galvanism." In 1878, Ephraim Cutter reported fifty cases of uterine fibroids treated by electrolysis by Kimball and himself. These cases were treated during the period extending from 1871 to 1877, with the following results: Non-arrests, 7; death, 4; arrests, 32; relieved, 3; cured, 4. Writing of these cases nine years later (in 1887), Cutter shows that time has served to strengthen rather than weaken the position which he and Kimball took as pioneers of this method, for the present résumé of those same fifty cases now stands thus: Non-arrests, 7; fatal, 4; arrests, 25; relieved, 3; cured, 11.

Dr. Robert Newman of New York is the veteran advocate in America of the electrolytic treatment. He reported the results of some of his labors in this direction as early as 1867. Reports of successful cases of electrolysis in extra-uterine pregnancy have been made by Drs. A. D. Rockwell, T. G. Thomas, E. G. Landis, N. Bozeman, Garrigues, J. C. Reeve, William T. Lusk, and others.

Hot water, which is so generally made use of in the treatment of diseases peculiar to women, and has had such an ardent advocate in Dr. Emmet, was first brought to the attention of the profession as a hæmostatic during surgical operations by the late Dr. Pitcher of Detroit in 1859.

A valuable contribution to gynecology has been made by Dr. H. Coe, the pathologist of the Woman's Hospital of New York. His published observations of certain conditions of the ovaries have been revelations to many who believed that anything appearing like a cyst upon the ovary indicates disease demanding removal. Some of his conclusions are as follows: Laparotomists often judge of ovarian diseases by—1st, thickening of the cortex of ovaries: such thickening is perfectly normal in the senile organ or after frequent ovulation; 2d, by the appearance of a "cystic" degeneration, which is often only hydrops folliculorum, and, according to Olshausen, "the stroma of the ovary in these cases is intact and most of the vesicles are normal." This condition seldom attains any clinical importance, because the changes produce no symptoms. Dr. Coe states the case of a perfect ovum found within a Graafian vesicle as large as a marble. Of a large number of tubes removed by different operators which Coe has examined, only one-fifth had true pyosalpinx. A less number were affected with hydro-

salpinx, and only one with hæmatosalpinx. An acute catarrhal salpingitis had been found in women who had died from acute peritonitis following extension of acute purulent endometritis. Chronic catarrhal salpingitis he has not found. Thickening of the fibroid muscular tissue without evidence of inflammation is rare. This condition has been designated pachysalpingitis. Coe gives this as a rule: Unless *pus* is found there is *no pyosalpinx*.

In 1882, Dr. Baker of Boston originated the cone-shaped excision of the neck of the uterus for cancer, the apex of the cone being carried far above the os internum. Dr. Baker has also cured a case of congenital malposition of the ureter. The ureter opened into the vagina near the meatus urinarius. He dissected up a portion of the misplaced ureter, made an opening in the original bed near the neck of the bladder, and turned the stump through it and closed the vaginal wall over it. About a year after he was obliged to open the bladder and remove a stone which had probably formed as the result of leaving a raw surface in the bladder. Phosphates are often deposited upon such surfaces.

In 1886, at a meeting of the American Medical Association, Dr. A. F. Pattee reported great success for many years with potassium chloride in the treatment of anæmia, exudations from pelvic cellulitis in ovarian neuralgia, menstrual headache with wakefulness, he having found the remedy more advantageous than potassium bromide or ammonium chloride.

Dr. Byrne of Brooklyn in the October and December numbers of the *New York Medical Journal* for 1878 published a new method of reducing inversion of the uterus by means of an instrument consisting of a curved stem, to the end of which is attached a cup for receiving the inverted uterus. The stem is traversed by a rod which is affixed to a disk forming a false bottom of the cup. Counter-pressure upon the abdomen is maintained by means of an open bell-shaped cup, through the centre of which passes a screw provided at the lower end with a conical plug of hard rubber, and on the opposite or lower extremity a flat knob for a handle.

Heretofore, in speaking of the mechanical treatment of uterine displacements, credit has been given to Dr. Hodge for his ingenuity, but American ingenuity has been taxed to its utmost in the invention of pessaries, the most valuable of which are some form or modification of the one originally invented by Hodge. Among those most worthy of mention are the pessaries of Thomas, Emmet, and Albert H. Smith. Gehrung of St. Louis has devised various forms—one particularly useful in anteversion or procidentia accompanied by anteversion or cystocele—and so has Cutter. All forms of gynecological instruments have been devised, and there is scarcely an operator but has originated or modified some form of instrument, to which his name is attached.

One of the improved pessaries is the block-tin pessary devised by Sims about 1859. He recognized the necessity of having a pessary fit the canal in which it was to be placed, and devised pessaries from that material to accomplish this purpose.

Prior to Dr. Sims's book most of the works published in this country upon diseases of women were either foreign works edited by American physicians or were treatises chiefly upon diseases of the puerperal state. In 1826 was published the treatise on *Diseases of Females*, by William P. Dewees. This book reached its tenth edition. From 1852 to 1855 the clinical lectures of Dr. G. S. Bedford were published in medical journals, after which they were published in book form. The work of Dr. C. D. Meigs, published in 1850, which ran through several editions and was written in the most charming manner, was in no degree a representative of modern gynecology. In 1860 was published *Diseases Peculiar to Women, including Displacements of the Uterus*, by Hugh L. Hodge. The first edition of Byford's work upon medical and surgical treatment of women was in 1865. Dr. Marion Sims's book, entitled *Clinical Notes on Uterine Surgery*, was published in 1866. In 1868 a treatise upon vesico-vaginal and vesico-rectal fistulæ, by T. A. Emmet, was published. In 1868 was published a book by T. Gaillard Thomas entitled *Practical Treatise upon the Diseases of Women*. This work was the fullest and most systematic treatise that had ever emanated from an American author. As early as 1880, so great had been the demand for this book, it had run through four editions, and the fifth was published, much revised and enlarged. Especially noteworthy are the chapters entitled respectively "An Historical Sketch of Gynecology" and "The Anatomy, Physiology, and Pathology of the Female Perineum." The former is a concise and most interesting article on gynecology, dating back to ancient times. The latter, an ably-written chapter, has especial reference to the functions of the perineal body and the necessity of restoring it after rupture, even though incomplete.

The first journal devoted to obstetrics and gynecology appeared in 1868, edited by Dr. B. F. Dawson, to whose energy and untiring efforts chiefly this journal owes its origin. It first appeared as a quarterly. After some years Dr. Dawson was succeeded by its present able editor, Dr. Mundé. The first journal devoted especially to gynecology was the *Journal of the Gynecological Society of Boston*, edited by Drs. H. R. Storer, G. H. Bixby, and W. Lewis. It first appeared in 1869, and exercised no inconsiderable amount of influence.

In 1872, Dr. E. N. Chapman, a former professor of obstetrics and diseases of women in the Long Island College Hospital, published his work on *Diseases and Displacements of the Uterus*, which met with rather rough usage at the hands of reviewers, although

possessing considerable merit. The book never reached its second edition.

In 1872, Dr. John Byrne's (of Brooklyn) monograph, entitled *Clinical Notes on the Electric Cautery in Uterine Surgery*, was published. Notwithstanding this gentleman's enthusiastic advocacy of the electric cautery and the good showing of his clinical reports, this mode of treatment is not at the present time held in the high esteem it once was by leading American gynecologists.

In 1872 was published by Appletons the truly classical work *On Ovarian Tumors*, by Edmund R. Peaslee, which was dedicated "To the memory of Ephraim McDowell, M. D., the father of ovariotomy, and to Thomas Spencer Wells, Esq., the greatest of ovariotomists." Of this great work his friend and biographer, Professor Fordyce Barker, writes for the third volume of the *Transactions of the American Gynecological Society:* "No work has been published in this country on any special subject of medical science of higher merit than his, as regards its plan of arrangement, its artistic excellence of execution, its literary finish, its learned, impartial, historical research, its soundness in pathology, its keen analytical teaching of diagnosis, its wise, prudent, practical, and thorough directions as regards treatment, both in the medical and surgical aspects of the subject." This work will be "an imperishable monument to his name."

Soon after Peaslee's book was published appeared another work (in 1873) on *Ovarian Tumors*, which had been announced, and the publication of which had been eagerly anticipated by all interested in the operation of ovariotomy in the United States. The work referred to was written by Washington L. Atlee, who up to this date had made more ovariotomies than any other American. This truly valuable book differs widely from Peaslee's, as it is more purely clinical and personal, showing as it does the many years of its author's labors as a pioneer ovariotomist. The twenty-fourth chapter of this volume, entitled "Dropsical Fluids of the Abdomen, their Physical Properties, Chemical Analysis, Microscopic Appearance, and Diagnostic Value, based on the Examination of Several Hundred Specimens," was contributed by Dr. Thomas M. Drysdale.

In 1876 appeared the first volume of the *Transactions of the American Gynecological Society*, which have appeared from year to year since that time. Allusion has herein before been made to the organization of this society and the influence which it has exerted on the progress of gynecology in this country. Nor has this influence been confined to the United States alone, but has been felt in foreign countries. After the appearance of the sixth volume of the *Transactions* the following introduction to a translation of one of its articles by the distinguished Prof. Kleinwächter appeared in the *Deutsches Archiv für Geschichte der*

Med. u Med. Geog., in which the translation was published. After writing at some length in a commendatory manner of the foundation of the society and its founders and *Transactions*, he says: "Up to the present time six volumes have appeared, which are an ornament to our libraries of special sciences and contain an abundance of highly interesting and valuable contributions, as would be expected, for amongst the co-workers may be enumerated such men as Washington Atlee, Fordyce Barker, William Byford, Thomas Addis Emmet, George Engelmann, William Goodell, Charles Carroll Lee, William Lusk, Paul Mundé, Emil Noeggerath, Randolph Peaslee, the universally-known and celebrated Dr. J. Marion Sims, T. Gaillard Thomas, and others whose scientific reputation is everywhere known and recognized." Aside from the scientific interest which the *Transactions* possess, Kleinwächter considers the medico-historical characteristics noteworthy: "The previous volumes contain full biographies of Simon (of Heidelberg), Charles Buckingham, Randolph Peaslee, Marmaduke B. Wright, and others. The fifth volume contains an extensive paper, illustrated with numerous cuts, upon midwifery among the various peoples of the globe, by Engelmann, and in the sixth is a noticeable contribution from the pen of Edward W. Jenks entitled 'The Practice of Gynecology in Ancient Times.'" . . . . "If the English and French cultivate the history of medicine, we need be less surprised, for both of these nations possess a famous history of more than a thousand years, and such a one doubtless stimulates historical research. The Americans are without an ancient national culture, and therefore without an ancient history, and yet we see them fostering the history of medicine. With this people κατ' ἐξοχήν of the present, necessity has compelled it to make a path for itself, in order to learn what the ancients knew and did, in order not to be too one-sided—in other words, more fully to comprehend the spirit of medicine than it is possible by the modern methods of so-called exact investigation."

In 1878 was established the *Obstetric Gazette*, published in Cincinnati and edited by Edward B. Stevens; it has also a department devoted to diseases of women.

Dr. Skene's book, entitled *Diseases of the Bladder and Urethra of Women*, first came out in 1878. This volume is the only one of its kind which has been published in this country, and its intrinsic value has greatly served to establish and extend the justly-deserved reputation of its author as an authority on the disorders of which it treats.

In 1879, Emmet published his work entitled *Principles and Practice of Gynæcology*. This work is a clinical work, and is totally unlike the systematic treatise of Thomas. Owing to the author's long connection with the Woman's Hospital of the State of New York, first as assistant to Dr. Sims, next as surgeon-in-chief for many years, and later as one

of the surgeons of the staff, his experience has given him great advantages in the way of clinical observation, of which his book bears an abundant evidence. This book has passed through several editions, the last one being practically a new book, so much has been rewritten and added since the first edition appeared.

In 1879 was published the clinical lectures of Dr. Wm. Goodell of Philadelphia, entitled *Lessons in Gynæcology.*

In 1881 a new edition of Byford's work was published on the diseases of women, but so changed from the first edition as to be practically a new work, fully abreast of the times and worthy of its industrious author.

In 1880, Mundé published a work entitled *Minor Surgical Gynecology.* The second edition appeared in 1885—a work of great use to the younger members of the profession, for whom chiefly it is written.

Obstetrical societies were formed many years ago in a few of the larger cities, but the first gynecological society organized was the Gynecological Society of Boston, established in 1869. Its *Transactions*, published monthly, exerted a widespread influence on the interests of gynecology, which was due chiefly to the labors of Dr. H. R. Storer and a few of his colleagues. Although the journal has been discontinued, Dr. Storer having been compelled to withdraw from active work by reason of his illness, the society continues to hold its stated meetings.

Other obstetrical and gynecological societies have been established quite universally. Where obstetrical societies exist, gynecology shares with obstetrics in the attention which is devoted to it. Gynecological societies exist in Washington, Chicago, Detroit, Baltimore, and several other cities, while the principal part of the work of the obstetrical societies of New York, Philadelphia, and some other cities seems to be gynecological.

In 1870 the American Medical Association passed resolutions recommending that the establishment of chairs of gynecology separate from that of obstetrics be more generally adopted by medical colleges and schools throughout the country. The direct cause of these resolutions was a memorial presented to the association by the Boston Gynecological Society. The Medical College at Castleton, Vt., was the first one in which special attention was given to the diseases of women, Dr. Woodward lecturing upon gynecology as well as upon obstetrics. Probably the first college to found a full professorship of gynecology was Dartmouth, Dr. Peaslee being its incumbent. About the same time Dr. H. R. Storer gave a full course of lectures on gynecology in Berkshire Medical College, Massachusetts, of which institution he was professor of obstetrics and diseases of women.

As early as 1871 there were thirteen medical colleges in the United States in which there were full professorships of gynecology and of obstetrics. Of this number, there were seven schools with full professorships of the diseases of women, incumbents teaching nothing else—namely, the Albany Medical College, E. R. Peaslee; Long Island Hospital College, A. J. C. Skene; St. Louis College of Physicians and Surgeons, M. A. Pallen; University of Louisville, T. Parvin; the Medical College of Ohio, C. D. Palmer; University of Pennsylvania, Wm. Goodell; Detroit Medical College, Edward W. Jenks; and there were eight professorships of gynecology and the diseases of children combined—namely, University of New York, F. D. Lente; Medical College of Virginia, J. S. D. Cullen; University of Maryland, W. D. Howard; Washington University, Baltimore, M. P. Scott; Miami Medical College, B. F. Richardson; Indiana Medical College, T. B. Harvey; Medical College of Evansville, D. Morgan; Louisville Medical College, J. A. Ireland. Since then the authorities governing medical schools and colleges, realizing the importance of gynecology, have in almost every instance added a separate professorship of that specialty.

The foregoing historical sketch of the rise and progress of gynecology in America, imperfect though it necessarily be, can scarcely fail to impress the reader with a sense of the important part which this country has borne in the development of this division of medicine. The profession of America has, in what it has already accomplished, both demonstrated a peculiar aptness in this particular field and given a guarantee for the future. With the increasing facilities which increasing wealth, and its accompaniment of growing freedom from the mere money-getting obligations resting on physicians, and the enthusiasm in their work which seems to an extent to be peculiar to workers in this field, the future of gynecology in this country is big with hope and promise. It is but fitting that the land which furnished the pioneers should furnish also those who shall carry on to its fullest possible perfection the work so auspiciously begun. The mantles of McDowell and Sims and Peaslee and the Atlees have fallen on worthy shoulders, and coming generations will accord to many now living places beside the pioneers who have rested from their labors.

THE DEVELOPMENT OF THE FEMALE GENITALS.

By HENRY J. GARRIGUES, A. M., M. D.,
New York.

As in other departments of the history of the development of the human body, so our knowledge of the earliest stages of development of the female genitals is chiefly derived from the study of the development of the corresponding parts in animals, especially the chicken and the rabbit.

The Wolffian Ducts.[1]

The first organs belonging to the genital sphere which appear in the male and female are the Wolffian ducts. In the chicken embryo they appear during the latter half of the second day. There is one on either side. It begins at the level of the fourth or fifth protovertebra, and extends rapidly backward, so that at the beginning of the third day it reaches the last protovertebra. At first it is a solid column, which later, by the formation of a cavity in its interior, is transformed to a tube. On cross-section of embryos it makes its first appearance as a small protuberance from the lateral plates where they come together with the protovertebral columns.

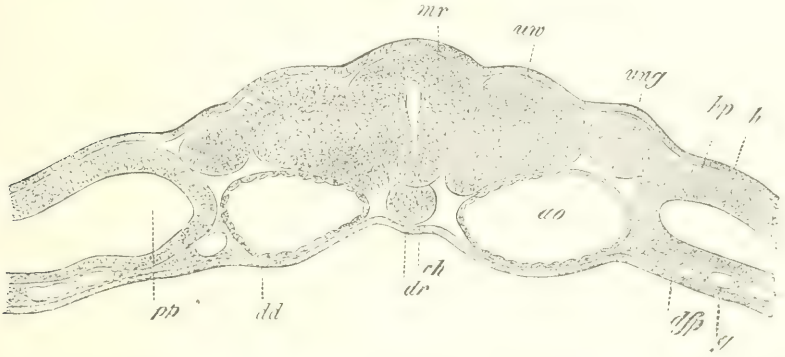
The posterior end of the Wolffian duct opens into that part of the allantois which is situated within the body of the embryo, and communicates with the cloaca, and later, after the separation between the intestinal and urogenital canal has taken place, into the urogenital sinus described below.

In the rabbit the Wolffian duct appears at the end of the eighth or the beginning of the ninth day, and is developed in the same way as in the chicken. On the eleventh day it opens into the urogenital sinus. Fig. 1 shows its situation between the protovertebral column, the lateral plate, and the descending aorta. On one side it is yet a solid string, on the other it has begun to be changed into a canal. In Fig. 2 we see it open into the urogenital sinus. Its lower end lies on either side of the body, imbedded in a ridge which Waldeyer has denominated *plica urogenitalis*. According to the same author, the Wolffian duct is

[1] Casper Friedrich Wolff, *Theoria Generationis*, Berlin, 1759; "On the Development of the Intestine," in *Nov. Comment. Acad. Petropol.*, 1768-69.

not formed by the perforation of a solid column, but by the application of the above-mentioned protuberance to the lateral plates, whereby first a channel, and then a closed tube, is formed.

FIG. 1.



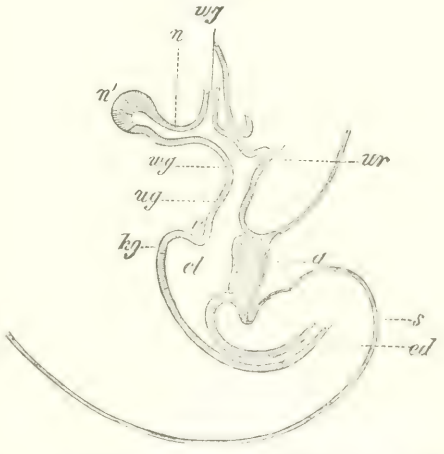
Transverse Section through the Median Part of the Body of the Embryo of a Rabbit of nine days and two hours (enlarged 158 times): *dd*, hypoblast; *dr*, intestinal groove; *ch*, notochord; *ao*, descending aortæ; *uw*, protovertebra; *mr*, medullary tube; *ung*, Wolffian duct; *dfp*, visceral division of the mesoblast; *g*, vessels in the deeper parts of the visceral mesoblast; *hp*, parietal mesoblast; *h*, epiblast; *pp*, pleuro-peritoneal cavity (Kölliker).

In the female embryo of a calf which measured one and a half inches in length Kölliker found the Wolffian duct composed of flat epithelium and a very thin fibrous membrane not yet quite separated from the surrounding tissue. It lay imbedded in a thick layer of blastema, which may be looked upon as the future peritoneal covering of the Wolffian body.

His found it as a cylindrical duct in a very young human embryo, the total length of whose body was only 2.4 millimeters.

While in the male sex the Wolffian duct is destined to play an important part in the adult animal, since in course of time it forms the tail of the epididymis and the vas deferens, in the female sex of man and most animals it disappears more or less completely, yet perhaps not to such an extent as was formerly thought. In the swine

FIG. 2.



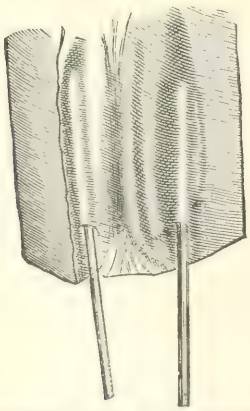
Sagittal Section through the Posterior Part of the Body of the Embryo of a Rabbit of eleven days and ten hours (enlarged 70 times): *wg*, Wolffian duct; *n*, ureter; *n'*, beginning formation of the kidney; *ug*, urogenital sinus; *cl*, cloaca; *hg*, region in which, in the mesial plane, the hind gut opens into the cloaca; *ed*, postanal gut; *a*, anus or fissure of the cloaca; *s*, tail; *r*, perineal fold (Kölliker).

and the cow the Wolffian ducts persist as Gartner's[1] canals, so called after the Danish physician Herman Treschow Gartner, who discovered and described them in 1822 as a glandular organ, but Malpighi had already described them in the cow in 1681 in his *Dissertatio ad Jacobum Sponium*. The identity of Gartner's canals with the Wolffian ducts was first shown by Jacobson. According to Chevau, these canals run in the cow in the lateral parts of the vagina and extend six or eight centimeters beyond the os uteri. Their posterior end opens in the vulva at the side of the urethral orifice. They are not known to be of any particular use, and nothing similar is found in the goat and the sheep. Kölliker found them as two fine tubules in the anterior wall of the uterus of the female embryo of a cow which measured three inches and four lines.

Milne-Edwards thinks that Gartner's ducts are analogous to the peritoneal tubes of crocodiles. In these animals the upper end opens into the peritoneal cavity; the lower is either closed or opens with a small opening furnished with a valve in the vulva.

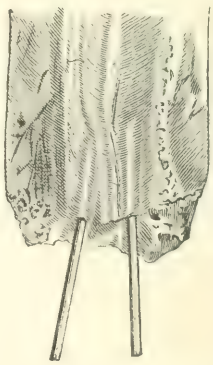
Beigel found Gartner's ducts in a female human fœtus of seven months' utero-gestation as small epithelial ducts situated laterally and anteriorly in the superficial layers of the uterus. Kölliker found yet distinct remnants of them in the broad ligaments of full-grown human fœtuses. Fischel has described a case of a newborn child in which

FIG. 3.



The Urethra laid open by division of its posterior or vaginal wall; the tubules distended by probes (Skene).

FIG. 4.



The Urethra laid open by division of its anterior wall; probes passed into the tubules (Skene).

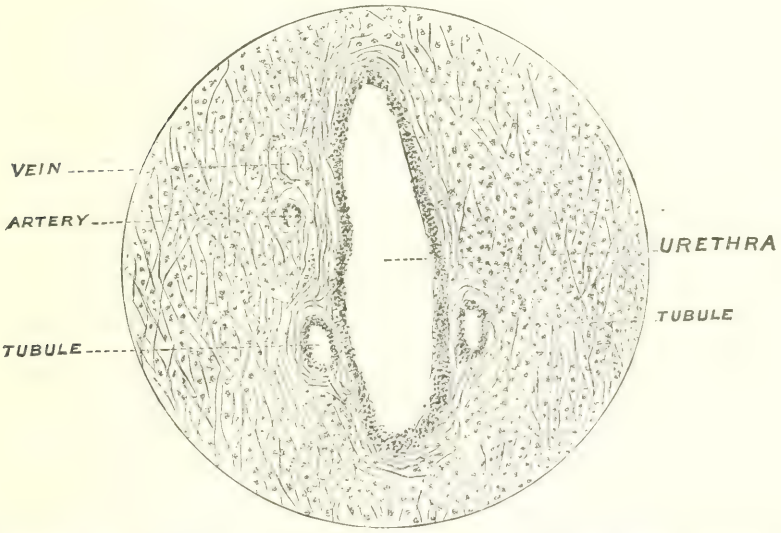
one of these ducts was found in the vaginal portion. Geigel found remnants of them in the wall of the vagina of a four months' fœtus, but not in the uterus, and in two fœtuses of six months they had totally

[1] The name is almost everywhere erroneously spelt Gärtner or Gaertner.

disappeared. Of late these ducts seem even to have been found quite frequently, by different observers, in the adult woman.

Dr. Skene of Brooklyn, N. Y., described in the year 1880 what he calls "two important glands of the female urethra," which by their position and structure seem to correspond with Gartner's ducts. He says that they are found on each side, near the floor of the female urethra, admit a No. 1 probe of the French scale, and extend upward, parallel to the long axis of the urethra, from three-eighths to three-fourths of an inch in the muscular tissue below the mucous membrane. The mouths of these tubules are found upon the mucous membrane of the urethra, according to the condition of the meatus, either one-eighth of an inch inside, or, if the mucous membrane is everted—which is not uncommon in those who have borne children—exposed to view on either side of the entrance to the urethra. The upper ends of the tubules terminate in a number of divisions which branch off into the

FIG. 5.



Transverse Section of the Urethra about a quarter of an inch from the meatus, showing the cross-cut of the tubules (Skene).

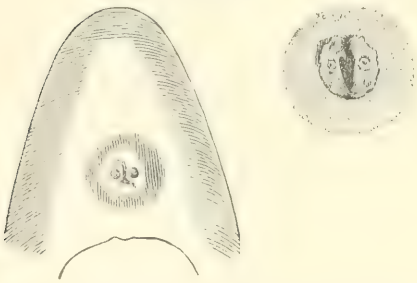
muscular walls of the urethra. Skene says he has investigated these tubules in more than a hundred different subjects, and found them constantly present and uniform in size and location.

Observations in most respects similar to those of Skene have been made by J. Kocks of Bonn. According to him, these remnants of Gartner's ducts are found in 80 per cent. of women. In newborn children they are relatively larger, but absolutely smaller, than in the adult. In old women they very frequently disappear. Micro-

scopical examination has failed to discover any glandular substance in them.

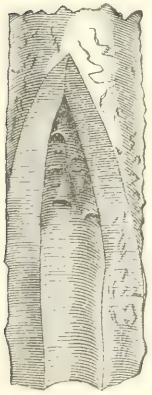
The observations regarding the persistency of Gartner's ducts have lost somewhat of their apparent reliability by Dohrn's investigations. He has for years examined human embryos with special regard to these ducts, and has come to the conclusion that, as a rule, they soon disappear. According to this author, they are only found, exceptionally, in embryos from the latter half of pregnancy. They reach the uterus at a point which later corresponds to the internal os, and become imbedded in the outer edge of the womb. In the vagina they are found in the tissue which surrounds the mucous membrane, but lower down they become indistinct, and they disappear totally before they reach the orifice of the urethra. Dohrn thinks that what has been described as persistent Gartner's ducts are only folds of the urethra. At the posterior part of the urethral orifice are normally found two such invaginations of the urethra, which extend upward as more or less deep pockets.

A B FIG. 6.



A, Vestibule of Vulva, with meatus urinarius, the everted mucous membrane showing the entrance to the tubules.
B, Meatus Urinarius, with everted mucous membrane and entrance to the tubules (Skene).

FIG. 7.



A Tubule laid open, and showing the branches at the upper end (Skene).

Wassilieff, who has described the two tubuliform glandular formations at the entrance of the female urethra in a Russian work in the same year as Skene —that is, two years before the article of Kocks—does not admit the correctness of Dohrn's criticisms. He has repeatedly examined these tubules on sections made after injection with Berlin blue, and found them lined with an epithelium very much like that of the prostate, and entirely different from that in the adjoining part of the urethra.

Carl Rieder found Gartner's ducts only persisting in eight out of forty cases.

From the results of these various investigations we may conclude that Gartner's ducts, *as a rule, disappear in the second half of pregnancy*, but that they exceptionally persist even in the adult woman.

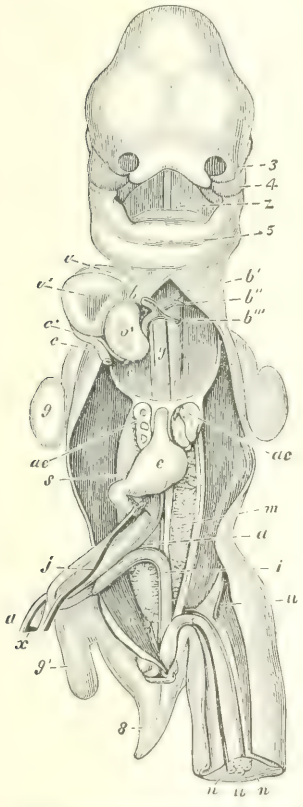
That the upper parts of these ducts occasionally persist, and may give rise to vaginal cysts, there is scarcely any doubt. I have myself examined a cyst of this kind extirpated by Dr. R. Watts of this city,

and both the clinical observation that the cyst at its upper end had a tubuliform continuation through which a uterine sound went up to the iliac fossa, and the histological composition of the sac, which corresponded with that of the vas deferens, determined me to take it to be a dilated Gartner's duct.[1]

The Wolffian Bodies.

Shortly after the Wolffian ducts—in the chicken at the end of the second and the beginning of the third day, in the rabbit on the ninth and tenth day—appear the so-called Wolffian bodies. His found them in a human fœtus of the first month whose body was 2.6 millimeters long. Like the ducts, they are placed symmetrically one on either side of the vertebral column. At the period of their highest development they extend as two long prismatic bodies from the level of the rudimentary diaphragm low down into the pelvis. At their upper end they are bound to the lower surface of the diaphragm by a small filament which Kölliker calls their "diaphragmatic ligament," and which Waldeyer explains to be the upper end of Müller's ducts, of which we soon shall speak. At their lower end they are fastened to the inguinal region by a filament which Kölliker calls their "inguinal ligament," and which in the course of time becomes the gubernaculum testis in the male and the round ligament in the female sex. The bodies are bound to the posterior wall of the abdominal cavity by a broad and low mesentery. They are so large that they fill the whole hollow of the posterior wall, leaving only a narrow fissure

Fig. 8.



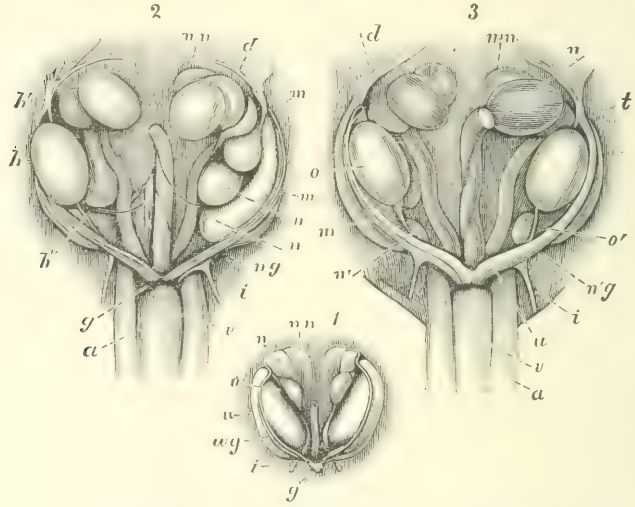
Human Embryo of thirty-five days (front view). 3, left external nasal process; 4, superior maxillary process; 5, lower maxillary process; 2, tongue; *b*, aortic bulb; *b'*, first permanent aortic arch; *b''*, second aortic arch; *b'''*, third aortic arch, or ductus Botalli; *y*, the two filaments to the right and the left of this letter are the pulmonary arteries, which begin to be developed; *c*, the stem of the superior cava and right azygos vein; *c'*, the common venous sinus of the heart; *c''*, the common stem of the left vena cava and left azygos; *o'*, left auricle of the heart; *v*, right, *v'*, left ventricle; *ae*, lungs; *e*, stomach; *j*, left omphalo-mesenteric vein; *s*, continuation of the same behind the pylorus, which becomes afterward the vena porta; *x*, vitello-intestinal duct; *a*, right omphalo-mesenteric artery; *m*, Wolffian body; *i*, gut; *n*, umbilical artery; *u*, umbilical vein; 8, tail; 9, anterior, 10, posterior limb. The liver has been removed. The white band at the inner side of the Wolffian body is the genital gland, and the two white bands at its outer side are the Müllerian and the Wolffian ducts (Kölliker, after Coste).

[1] "Trans. New York Obst. Soc.," *Am. Journ. of Obst.*, October, 1881.

on either side. In the inner one of these fissures is later developed the genital gland; in the outer one runs the Wolffian duct, and later likewise the Müllerian duct. Their posterior surface rests on the blastema (in which later the kidneys are developed), on the aorta, and on a large vein which takes up the blood coming from the bodies.

The Wolffian bodies are formed from the lateral plates—or, more precisely, from the cellular lining of the peritoneal cavity —as a long row of small pear-shaped, solid bodies, which soon become separated from the endothelium of the peritoneum and become hollow, in which stage they are called segmental vesicles. These vesicles are in contact with the Wolffian duct, and soon the thin layer which separates the two

FIG. 9.



The Genital and Urinary Organs of the Embryos of Cattle: 1, from a female embryo 1½ inches long (double size): *w*, Wolffian body; *wg*, the Wolffian and the Müllerian ducts; *i*, inguinal ligament of the Wolffian body; *o*, ovary with an upper and lower peritoneal fold; *n*, kidney; *nn*, suprarenal body; *g*, genital cord, composed of the united Wolffian and Müllerian ducts. 2, from a male embryo 2½ inches long (nearly three times natural size): one of the testicles has been removed. Letters as in fig. 1, and, besides, *m*, Müller's duct; *m'*, upper end of the same; *h*, testicle; *h'*, lower ligament of the testicle; *h''*, upper ligament of the testicle; *d*, diaphragmatic ligament of the Wolffian body; *a*, umbilical artery; *v*, bladder. 3, from a female embryo (enlarged nearly three times): letters as in figs. 1 and 2, and, besides, *t*, opening at the upper end of Müller's duct; *o'*, lower ovarian ligament; *u*, thickened part of the Müllerian duct, which later becomes the uterine horn (Kölliker).

cavities is absorbed, so that henceforth the vesicles appear as invaginations from the duct, which as to origin they are not. These grow rapidly, and are transformed into long convoluted tubes, which in the inner part of the Wolffian bodies connect with arterial tufts in a similar way as the uriniferous ducts of the permanent kidneys combine with arterial convolutions to form the Malpighian tufts.

The Wolffian body is in the male developed into the epididymis and

Giraldez's[1] body (Fig. 10). In the female sex these two parts are less prominent. Corresponding to the epididymis we have Rosenmüller's[2]

FIG. 10.

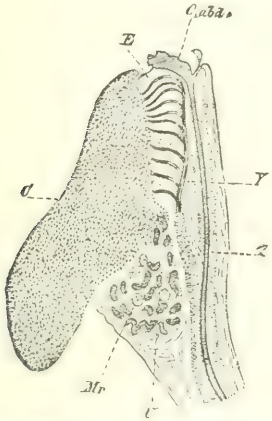


FIG. 11.

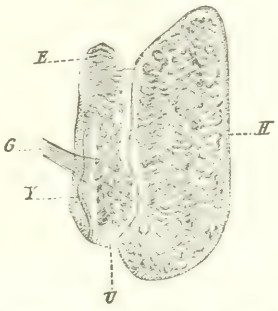


FIG. 10.—Internal Genital Organs of a Female Human Fœtus 3½ inches long (enlarged 10 times): *O*, ovary; *Z*, Fallopian tube; *Oabd*, abdominal opening of the tube; *E*, epoöphoron (upper part of the Wolffian body); *U*, paroöphoron (lower part of the Wolffian body); *Y*, Wolffian duct, the lower part of which disappears, but its place is marked by thickened tissue that combines with the thickened connective tissue surrounding the tube; *Mp*, Malpighian bodies (Waldeyer).

FIG. 11.—Internal Genital Organs of a Male Human Fœtus 3½ inches long (enlarged 8 times): *H*, testicle; *E*, epididymis (the upper part of the Wolffian body); *U*, paradidymis, or Giraldez's organ (the lower part of the Wolffian body); *G*, bundle of connective tissue with blood-vessels; *Y*, vas deferens (Wolffian duct) (Waldeyer).

organ, or the parovarium, and Giraldez's organ is represented by stray tubes found in the broad ligament between the parovarium and the uterus (Fig. 11). They are filled with epithelial cells and detritus, and often give rise to the formation of cysts. I have frequently seen small cysts situated between the parovarium and the uterus. It is therefore not an improvement when of late years some authors substitute the term "parovarian cyst" for the older term "cyst of the broad ligament." When a cyst forms in any part of the broad ligament and acquires surgical proportions, it will scarcely be possible to prove that it has been developed in the parovarium. The term "cyst of the Wolffian body," on the other hand, would probably be more correct, although there is a possibility that any small agglomeration of cells belonging to the native germ-epithelium, which will be described later, may become the starting-point of an extra-ovarian cyst.

In order to show the homology between the named organs in the two sexes, Waldeyer has proposed to call Giraldez's organ "parepididymis."

[1] Giraldez. "Recherches anatomiques sur le corps innominé." in Brown-Séquard's *Journ. de l'Anat. et de la Physiol.*, 1861.

[2] Rosenmüller, *Quaedam de ovariis embryonum et foetuum humanorum*. Lipziae, 1802.

or, shorter, "paradidymis," Rosenmüller's organ "epoöphoron,"[1] and the tubules between this organ and the uterus "paroöphoron."[2]

The Ovaries.[3]

The sexual glands are originally entirely alike in the two sexes. They make their first appearance very soon after the Wolffian bodies—in the chicken on the fifth day, in the rabbit on the twelfth or thirteenth, in man in the fifth or sixth week. In the latter they begin as a white streak, called "the genital ridge," on the inner side of the Wolffian bodies. This streak extends almost as far as the bodies themselves, and is in close contact with them. How it is formed in man is not known, but in chickens the process has been studied step by step. In these animals the genital glands originate as a thickening of the epithelium of the inner part of the Wolffian bodies. This part of the peritoneal epithelium differs from the other by being composed of columnar cells, and as it forms the substance of which the Fallopian tubes, the ovaries, and the ova are formed, Waldeyer has designated it as the "germ-epithelium" (*Keimepithel*).

It is not before the end of the second month that the ovaries begin to differ from the testicles in man, the latter becoming broader and

Fig. 12.

Perpendicular Section through the Ovary of a Human Fœtus of thirty-two weeks (Hartnack, $\frac{2}{3}$): *a*, epithelium; *b*, *b*, cells in the epithelium which become primordial ova; *c*, prolongations of connective tissue growing into the epithelial layer; *d*, *d*, cluster of epithelial cells in the process of being imbedded; *e*, *e*, primordial follicles with a wall formed of narrow connective-tissue cells; *f*, groups of imbedded epithelial cells, some of which are larger than the others (primordial ova); *g*, granular cells (His).

shorter, while the former retain their lengthy shape, and in the ninth or tenth week take a more oblique direction.

Another early sign of distinction between the testicles and the

[1] Ἐπί, upon; ὠάριον, egg; φέρω, I carry.

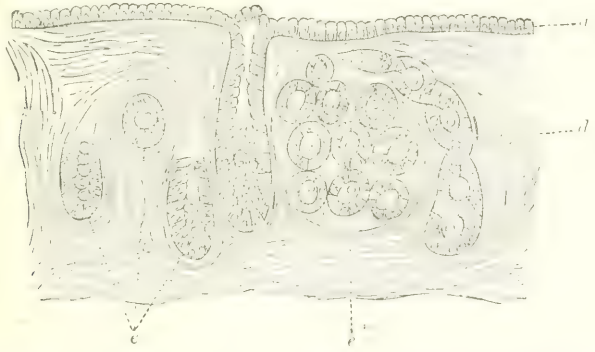
[2] Παρά, beside.

[3] Latin, *ovum*, egg.

ovaries is that the latter have a much more developed columnar epithelium. In the chicken this difference is present as early as the end of the first week.

Even before the distinction between the sexual glands takes place they are fastened to the Wolffian bodies by means of a small fold of the peritoneum, which, according to the sex, is called "mesorchium" or "mesoarium." From the upper end of the reproductive gland a small ligament runs to the diaphragmatic ligament of the Wolffian body, and the lower end is bound by another ligament to the Wolffian duct opposite the starting-point of the inguinal ligament of the Wolffian body (Fig. 12).

FIG. 13.



Perpendicular Section through the Ovary of a Bitch of six months (Hartnack, $\frac{2}{3}$): *a*, epithelium; *b*, epithelial pouch, opening on the surface; *c*, larger group of follicles; *d*, ovarian tube containing ova; *e*, oblique and transverse sections of ovarian tubes (Waldeyer).

Originally both ovaries have about the same size, but from about the fifth month of gestation the left ovary is left considerably behind as to development. In the eighth week their length is 2.5 to 3 millimeters (Puech). Meyer furnishes the following figures as indicating the length of both ovaries of human fœtuses at different periods, the figures being the average of several measurements:

Age in weeks.		10.	15.	20.	24.	28.	32.	36.	40.
Length of the ovaries in millimeters	right	3.8	5.0	11½	12½	14½	16½	16½	20½
	left	3.7	5.0	12	11	12⅔	13½	13½	17½

Puech mentions likewise the greater length of the right ovary, but the average difference in forty cases was only about one and a half millimeters, the average length of the right being 19.8 millimeters; of the left, 18.2.

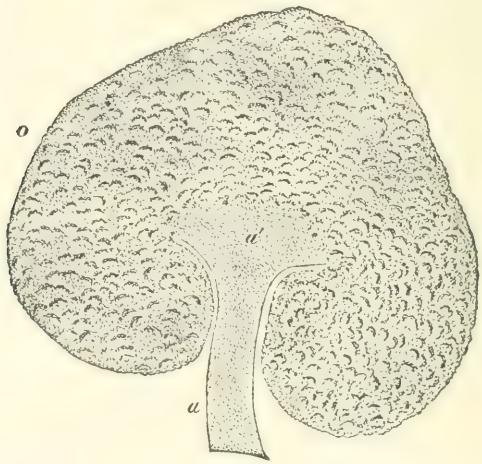
During the first two-thirds of gestation the uterus and the ovary keep almost equal pace as to size, but from the end of the seventh

month the uterus increases much more rapidly. In the following list, taken from Meyer, the length only is considered, and that of the ovaries is the average found for the two:

	Uterus.	Ovaries.
10th week	— mm.	3.8 mm.
15th "	$5\frac{1}{2}$	5
20th "	$9\frac{1}{2}$	12
24th "	$11\frac{1}{2}$	$11\frac{3}{4}$
28th "	$12\frac{1}{2}$	$13\frac{1}{2}$
32d "	19	$15\frac{1}{4}$
36th "	24	15
40th "	28	19

The shape of the ovary varies very much at different periods. At first it is a long flat body; later it grows, especially at the edges, so that a cross-section presents the figure of a bean or a mushroom, as in Fig.

Fig. 14.



Transverse Section through the Ovary of a Human Embryo of three months (enlarged 43 times; *o*, mesoarium; *a*, stroma of the hilus (medullary substance); *b*, glandular tissue (cortical substance) (Kölliker).

14. About the middle of gestation the lips at the hilus disappear, and the line of insertion of the mesoarium approaches the lower and posterior edge, so that a cross-section presents a pear-shaped appearance. In the fœtus as well as in the infant the surface of the ovaries shows impressions of the surrounding organs. It is first at the end of the second year that the organ has become resistant enough to maintain an even surface independent of the contiguous parts.

The ovary is subject to a descent similar to that of the testicle. It takes place soon after the tenth or eleventh week, so that the ovary at the end of the fifteenth week is found almost in the same place as later.

Yet even in newborn children and shortly after birth we find the ovaries situated above the ileo-pectineal line. As a rule, the ovaries descend into the true pelvis during the first two or three months after the birth of the child (Kölliker). The descent consists chiefly in a change of direction, and not in a true change of the distance between the ovaries and the uterus. At the earliest period the lower end of the ovary is found opposite the starting-point of the round ligament of the uterus. Most of the apparent descent is due to a disproportion in the growth of the parts situated above and below the ovaries. The shrinking of the round ligaments, which are composed of cellular elements and much fibrillar tissue—a shrinking analogous to that which takes place in cicatricial tissue—seems likewise to be at work, but to be of subordinate importance. By the change in direction referred to the upper end turns outward and sinks considerably downward; the lateral edge becomes the superior or free edge; the mesial edge becomes the lower; the ventral or anterior surface is turned inward to the mesial line; the dorsal or posterior surface is turned outward to the side of the pelvis (Kölliker).

The relations to the Fallopian tubes are changed in such a way that the ovary, instead of being situated on the inner or mesial side of the Müllerian duct, finally lies behind and below the Fallopian tube. The right ovary is from the tenth week of gestation placed lower and nearer the uterus than the left.

At the upper end of the fœtal mesoarium enter the ovarian vessels from the posterior abdominal wall, and extend downward, enclosed in a particular fold of the peritoneum, which exhibits a free lateral edge and in course of time becomes the infundibulo-pelvic ligament, extending from the fimbriated end of the Fallopian tube to the side wall of the pelvis.

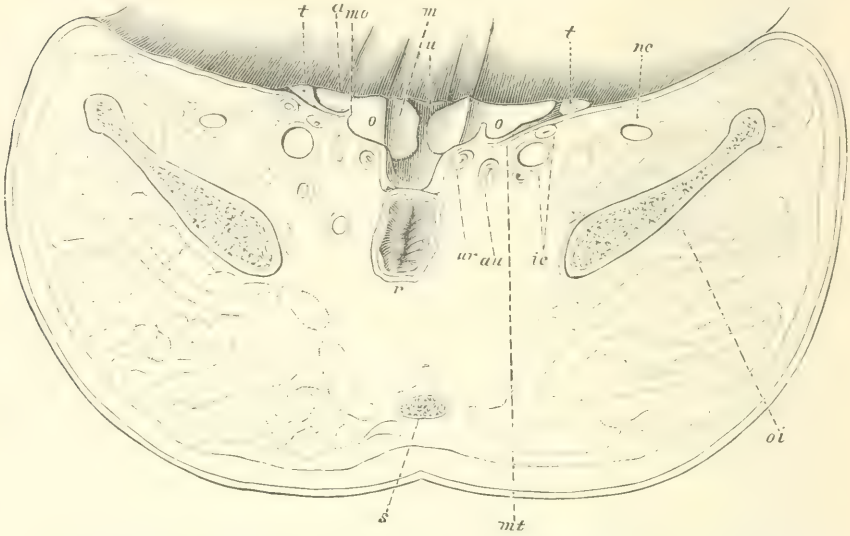
To the lateral side of the mesoarium is attached the mesosalpinx, or mesentery of the Fallopian tube. In older embryos it is stretched out behind the ovary as a fine membrane, the free outer edge of which surrounds the Fallopian tube. In a previous stage this membrane formed the peritoneal covering of the Wolffian body, and contains the remnants of this body, especially the parovarium.

The inner (lower, anterior) end of the ovaries is bound to the uterus by means of the ovarian ligament, which is a continuation of the mesoarium. At the middle of gestation these inner ends lie pretty near one another. They rest on the ureters and the umbilical arteries, while the outer (upper, posterior) part of the ovaries is placed in front of the external iliac vessels. The broad ligament cannot be said to exist yet, the uterus filling the whole cavity of the true pelvis. What starts from its sides is nothing but the already-mentioned formations—namely, the mesoarium, the mesosalpinx, and the round ligament; which latter, as

we have seen above, is originally a ligament belonging to the Wolffian body, and only enters into connection with the uterus after the destruction of those bodies.

While the tubes, and likewise that part of the uterus which is situated in the peritoneal cavity, are covered all over with peritoneum, the

FIG. 15.



Transverse Section through the Ovarian Region of a Human Embryo of five months, lower surface seen from above (enlarged 3 times): *oi*, os ilium; *s*, sacrum; *mo*, mesoarium and the hilus of the ovary, bounded by two lips; *o*, cut surface of the ovary; *v*, free ventral surface of the ovary or lateral part of the ventral surface; *t*, tube; *mt*, mesentery of the tube (later the ala vespertilionis); *r*, rectum; *ur*, ureter; *au*, umbilical artery; *ie*, external iliac vessels; *nc*, anterior crural nerve (Kölliker).

ovaries are, as it were, lodged in two holes of the peritoneum. Only quite near the hilus have they a sheath of that membrane.

The formation of the ova and Graafian follicles[1] has especially been elucidated by Waldeyer, and his views have with slight modifications been corroborated by H. Meyer, the most recent investigator of the subject, and by Allen Thomson. At the earliest stage we have seen the ovary to be represented by a streak composed of cells developed from the peritoneal covering of the Wolffian body. Very soon a protuberance of connective tissue makes its way from behind into this cell-heap. These two different parts are the beginning of the two substances which go to build up the ovary, the connective tissue forming the stroma; the cells, the parenchyma or glandular part; but in the ensuing development these two elements become most intimately interwoven. The stroma sends out between the cells prolongations which separate them into groups, and grow together over them, so as

[1] Regnier de Graaf, *De Mulierum organis generationi inservientibus*, Leyden, 1672.

to form a layer of connective tissue above them; but simultaneously new layers of cells are formed outside of the first border-line, which

FIG. 16.

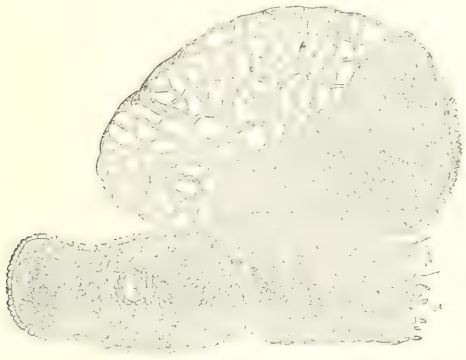


FIG. 17.

FIG. 16.—Ovary of a Human Fœtus of ten or eleven weeks: *a*, superficial stratum of cells; *b*, layer of connective tissue; *c*, trabeculæ of connective tissue, the cells having been removed; *d*, mesoarium (Meyer).

FIG. 17.—Part of the same Ovary, near the surface, seen with higher power: *a*, natural size of the ovary.

again become divided into groups by new prolongations of the stroma. The chief direction of these prolongations is a radial one from the hilus

FIG. 18.

From a Fœtus of sixteen weeks. The formation and separation of ova (Meyer).

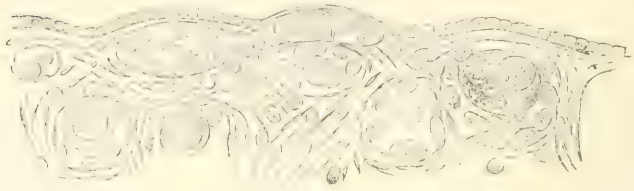
to the surface. At an earlier stage they are entirely irregular, and do not form closed cavities, but an irregular system of meshes and anas-

FIG. 19.

From a Fœtus of twenty-eight weeks. In some places is already seen the permanent epithelium, composed of a single layer (Meyer).

tomosing tubes, much like those seen in a sponge. At the surface is a particular zone composed of several layers of cells, between which are

FIG. 20.

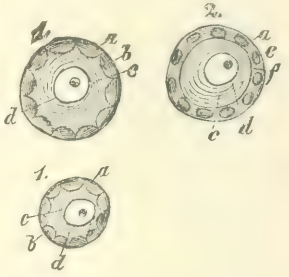


From a Fœtus of thirty-six weeks. The single epithelial layer is interrupted by the intercalation of a belated primordial ovum with its follicular epithelial cells (Meyer).

FIG. 21.

Part of Section from surface to hilus of Ovary from Girl three days old: single layer of epithelium yet in connection with a cluster of primordial ova. All ova have disappeared from the surface. A broad layer of stroma separates in most places the epithelium from the follicular zone. The farther we go from the surface toward the hilus, the fewer ova are there in one nest, until finally there is only one in its primary follicle. *n*, natural size of the whole ovary (Meyer).

FIG. 22.



Three Graafian Follicles from the Ovary of a Newborn Girl (enlarged 350 times): 1, natural condition; 2, treated with acetic acid: *a*, structureless membrane of follicles; *b*, epithelium (membrana granulosa); *c*, yolk; *d*, germinal vesicle, with germinal macula; *e*, nuclei of the epithelial cells; *f*, vitelline membrane (very fine) (Kölliker).

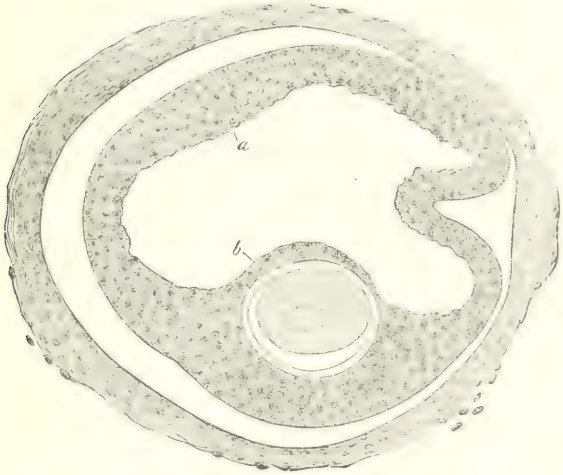
found fine prolongations from the stroma; and this zone is separated from the rest of the parenchyma by a fine layer of connective tissue (Fig. 16).

From the end of the sixth month the surface begins, in some places, to form a single layer of epithelial cells (Fig. 19), and in the newborn girl the whole ovary is covered with such a single layer of low columnar cells, under which lies a more or less thick layer of connective tissue, the so-called albu-

ginea (Fig. 21). This is by no means a separate membrane, but only a somewhat denser part of the ovarian stroma. (Figs. 18–20 show the gradual change of the surface.)

In the mean time the prolongations extending from the hilus to the surface have grown in thickness, length, and width, and new prolongations have grown from the walls of the older meshes, dividing the cell-groups into smaller and smaller compartments, until finally one large cell with one or more smaller ones is entirely enclosed in a cavity formed by the stroma (Fig. 20). These large cells, containing a large nucleus, are the future ova, and are called primordial ova. The compartment in which they are found imbedded with the small epithelial cells are called primary follicles (Figs. 18, 19). The smaller cells increase in number and form several layers. A fissure appears between these layers, and a liquid accumulates in the interstice, forming the beginning of the liquor folliculi. The outer layers form the epithelium of the Graafian follicles, the so-called membrana granulosa; the inner continue to surround the ovum and form the discus proligerus, or, as

FIG. 23.



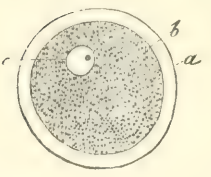
Graafian Follicle from a Girl seven months old enlarged 220 times; natural size, 0.351 mm.: *a*, epithelium (membrana granulosa) detached from the fibrous membrane; *b*, discus proligerus or cumulus ovigerus, situated far away from the surface. It contains the ovum, on which the zona pellucida and the germinal vesicle are visible. The surrounding fibrous membrane of the follicle is not yet separated into two layers, and there is no distinct line of demarkation between it and the stroma. (Kölliker).

Kölliker more graphically designates it, the cumulus ovigerus—*i. e.* the heap containing the ovum (Fig. 23). At what time this formation of the true Graafian follicles normally takes place is not yet decided. Some have found them in the newborn child, others only after the age of two years and a half.

At first the primordial ovum is a simple protoplasmic body without any membrane, the zona pellucida (Fig. 24) appearing after the formation of the Graafian follicle is completed.

The fibrous membrane of the follicle is formed by a differentiation of the surrounding stroma. After the completion of the follicles they can easily be enucleated from the surrounding stroma, showing that the connection with the latter has been loosened. This seems to be due to the formation of numerous lymph-spaces in the connective tissue surrounding the fibrous membrane of the follicles.

Fig. 24.



Human Ovum from a medium-sized Follicle (enlarged 250 times): *a*, vitelline membrane, or zona pellucida; *b*, limit between the yolk and the zona pellucida; *c*, germinal vesicle with germinal spot (Kölliker).

As here described, the ova, the surface epithelium of the ovaries, and the epithelium lining the inside of the Graafian follicles have all one and the same origin; but it might be proper to add that while all observers have corroborated Waldeyer's doctrine as to the formation of the ova, there obtains some difference of opinion as to the origin of the epithelium of the follicles, the so-called membrana granulosa. While Waldeyer gives it the same origin as the ova—namely, the germ-epithelium covering the surface of the ovaries—Foulis believes it is formed from the stroma of these glands. According to Kölliker, the process is much more complicated. In that part of the ovary which is situated nearest to the hilus are found cords composed of small cells and canals lined with columnar epithelium, which, like several other microscopists, Kölliker takes to be remnants of the Wolffian body. But he has found that these so-called medullary cords come in contact with the primordial ova which are exclusively found in the more superficial layers of the ovary, and, according to him, they surround these ova and furnish the membrana granulosa of the Graafian follicle.

The great simplicity of Waldeyer's theory, and new observations in lower animals by other embryologists, would seem to give that theory the preference, according to which the epithelium of the follicle and the ovum which it encompasses are derived from the same source; and recently this view has been corroborated by the investigations of Meyer in human embryos.

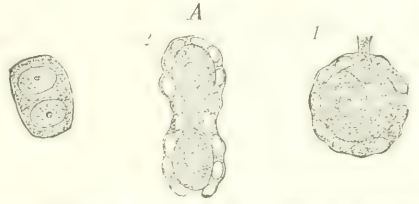
It is very likely, although not yet positively proved, that the cells which are destined to become ova after being surrounded by stroma multiply by division. This would constitute a second source of the enormous number of ova contained in the ovaries, which has been evaluated by Henle to thirty-six thousand in each gland (Fig. 25).

The formation of ova on the surface of the ovaries ceases almost entirely from the time they are covered with a single layer of epithelium—that is to say, about the end of the seventh month—but it is

not unlikely that the formation of new ova by division may go on much longer.

From the time of the birth of the child to that of puberty the ovaries simply grow in size and become smoothed and rounded off. In children from six to eleven years old the average measures of the right ovary are — length, 26.7 millimeters; height, 9.0; thickness, 4.4; the left, length, 24.0; height, 8.4; thickness, 4.6. In girls of thirteen to fourteen years the average measures are —right ovary, length, 29.6; height, 15; thickness, 10; left, length, 25; height, 14; thickness, 9.3 (Puech). At the age of puberty a new life begins in the organs by the periodical development and rupture of the Graafian follicles, by which the ova are set free. (For the particulars of this process we refer the readers to works on physiology and anatomy.)

FIG. 25.



From a Human Embryo of six months enlarged 400 times: 1, two primordial ova surrounded by a common layer of epithelium, one of which has a prolongation by means of which it probably was attached to another ovum, as in 2, where two primordial ova are linked together by means of a band of protoplasm, the whole surrounded by one epithelial layer. 3, primordial ovum with two nuclei (germinal vesicles) (Kölliker).

THE MÜLLERIAN[1] DUCTS.

In no part of our study of the development of the female genitals are we more forcibly reminded of the yet unsettled condition of embryology than in regard to the Müllerian ducts—an uncertainty which is explainable when we remember that these investigations are of a comparatively recent date, that different observers sometimes have worked on the embryos of different animals, and that gradually new and improved methods have been adopted in the preparation of the specimens. As heretofore, we will chiefly follow Kölliker, the author of the most complete work on human embryology in any language. According to this authority, Müller's ducts appear shortly after the Wolffian bodies—in chickens on the sixth day, in rabbits on the twelfth or the thirteenth day. They begin as a funnel-shaped invagination from the germ-epithelium at the inner side of the upper end of the Wolffian bodies, on a level with the fifth protovertebra (Fig. 26). From this locality the Müllerian duct extends behind the Wolffian body to its outer part, where it lies close up to the Wolffian duct, outside of this latter duct; but gradually the Müllerian duct turns spirally round the Wolffian duct, so as to come in front of it, then inside of it, and finally behind it. The lower end is in young embryos

[1] Johannes Müller, *Handbuch der Physiologie der Menschen*, Coblenz, 1834 *et seq.*

formed of a solid mass of cells, in which subsequently a canal appears. In the chicken this whole development is finished in the course of two days, when the duct opens into the cloaca. In the rabbit the development takes considerably longer time, probably nineteen or twenty days. In human embryos the perforation takes place in the seventh week. This is the origin of the Müllerian ducts as observed by Bornhaupt, Egli, and Kölliker in the chick and the rabbit.

Waldeyer, on the other hand, who has investigated the matter in chickens, pretends that the duct is formed from the germ-epithelium as

FIG. 26.

Transverse Section through the upper end of the Wolffian Body of the Embryo of a Rabbit of 14 days (enlarged 140 times): *wg*, Wolffian duct; *m*, connection between a tubule of the Wolffian body with a Malpighian body; *t*, entrance to the Müllerian duct (later the abdominal ostium of the Fallopian tube); *g*, *g*, mesentery of the Wolffian body, containing a glandular tubule; *l*, *l*, surface of the liver; *hb*, posterior abdominal wall; *mg'*, lateral part of the Müllerian duct (Kölliker).

a canal which, at first open, becomes gradually closed by the fusion of the borders, so as to form a closed tube.

A third view is that put forth by Balfour and Sedgwick. According to these authors, Müller's duct is at first a solid string of cells which becomes detached from the outer wall of the Wolffian duct.

The Müllerian duct has a mesentery of its own, which is first attached to the Wolffian body. After the absorption of that organ it is fastened to the posterior abdominal wall, and at a still later stage we find it starting from the outer surface of the mesoarium, as described above in speaking of the ovary.

If thus the origin of the Müllerian ducts is still somewhat uncertain, their further development and ultimate fate are well known. In the male sex they disappear very soon almost entirely. In the male

embryo of a rabbit of twenty-three days' gestation Kölliker found no trace of them. In the chicken they disappeared likewise completely after the twelfth day. In some animals, such as the ruminants and the Carnivora, some remnants of them are found as vesicular formations at the fundus of the bladder. In man the whole central part of them is absorbed. The upper end is left, and forms the small vesicle attached to the epididymis which is called Morgagni's hydatid. The lower end likewise remains, and forms the vesicula prostatica, which corresponds to the uterus and vagina. While in the male sex only vestiges, without any physiological importance, are left of the Müllerian ducts, in the female they become the ducts through which the ovum passes from the ovary, the receptaculum in which the fœtus is developed, and the tube in which sexual connection takes place, and through which the offspring is brought out to separate existence.

The Fallopian[1] Tubes.

These organs are a development of that part of the Müllerian ducts which is situated above the round ligament. In the course of time it increases in size; it changes direction in following the ovary down, and comes to occupy a position above and in front of the latter organ; the muscular coat and mucous membrane are developed, and around the opening at the upper outer end sprouts out the row of tongue-like prolongations constituting the fimbriæ.

The Uterus[2] and the Vagina.[3]

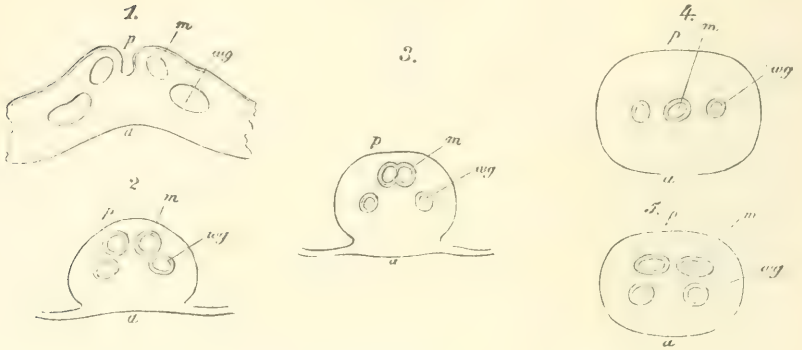
That part of the Müllerian ducts which is situated below the insertion of the round ligament and the lower ends of the Wolffian ducts enter into close connection and form a quadrilateral cord with rounded-off edges, the so-called genital cord. (See Fig. 27.) Cross-cuts through this cord show that at the upper and lower ends there are four epithelial tubules, the Müllerian ducts lying behind the Wolffian ducts; but in the intermediate part the two Müllerian ducts are seen growing or grown together, so as to form one single tube, which is the first appearance of the uterine cavity. From pathological specimens Schatz has inferred that the fusion begins just below the place where later the vaginal portion will be situated. This fusion of the Müllerian ducts takes place in the human embryo at the end of the second month. As the whole of the genital cord is used to build up the uterus and the vagina,

[1] Gabriele Fallopio, *Observationes anatomicæ*, Venet., 1561.

[2] Classic Latin name for the womb, but in ancient times comprising the whole genital tract.

[3] Classic Latin, meaning a sheath.

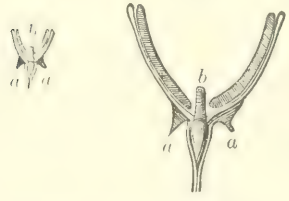
FIG. 27.



Transverse Section through the Genital Cord from the Embryo of a Cow 2½ inches long (enlarged 14 times): 1, from the upper end of the cord (the ducts have been cut somewhat obliquely); 2, somewhat lower down; 3 and 4, from the middle of the cord, showing incomplete and complete fusion of Müller's ducts; 5, from the lower end, showing the two Müllerian ducts separated; *a*, anterior; *p*, posterior side of the genital cord; *m*, Müller's duct; *wg*, Wolffian duct (Kölliker).

the lower parts of the Wolffian ducts contribute their share to the formation of these organs. In the third month the uterus is still two-horned; that is to say, those parts of the Müllerian ducts which lie nearer the round ligaments are not yet united. (See Figs. 28 and 29.) As just stated, the fusion begins in the middle, while the ducts are still separated above and below. The upper parts constitute the horns of the uterus, which persist in many animals, but in woman gradually grow together, the partition between them becoming absorbed, until finally, about the middle of pregnancy, the uterus forms one sac without horns, as seen in Fig. 30, and containing a single cavity. The lower parts later become fused together, except when, by an arrest of development, they persist as two and form a double vagina—a point to which we will come back in treating of malformations.

FIG. 28. FIG. 29.

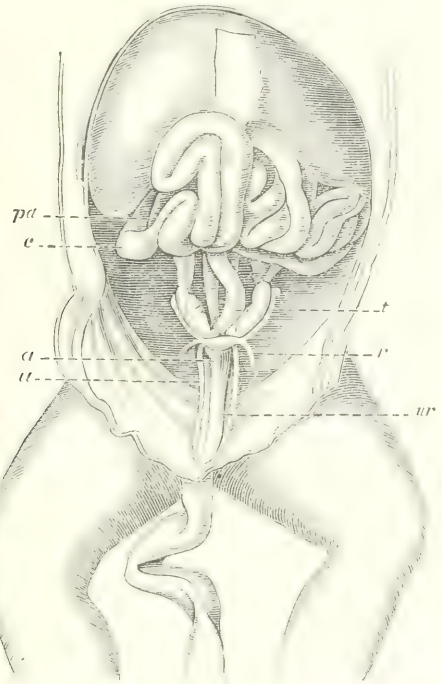


Ovaries, Tubes, and Uterus from a Human Fœtus from the tenth week. 25 mm. long (Fig. 28 natural size; Fig. 29, enlarged four times): *a*, the round ligament; *b*, rectum (Meyer).

The Müllerian ducts open into the lower part of the urachus—*i. e.* that part of the allantois which is comprised in the body of the embryo and forms the bladder (Fig. 31). This lower part, from the openings of the Wolffian and Müllerian ducts downward, is called the sinus urogenitalis (Fig. 2, p. 69). Originally, it opens into the cloaca, a common vault, in which end the urogenital system and the intestine (Fig. 31), and which communicates with the surface through the cloacal opening formed by an invagination from the epiblast and thinning

of the tissue intervening between it and the gut. This perforation takes place in the human embryo in the fourth week. In the course

FIG. 30.



Abdominal and Pelvic Viscera of a Female Embryo of five months (length, from vertex to sole, 19 centimeters—natural size): *t*, tube; *r*, round ligament; *v*, bladder; *a*, umbilical artery; *ur*, urachus; *c*, cæcum; *pa*, vermiform appendix (Kölliker).

of the sixth and seventh weeks the common orifice is seen to become divided into two parts—viz. the longer slit of the genito-urinary aperture anteriorly, and the narrower and more rounded anal opening posteriorly. This separation of the single cloacal opening into two is probably mainly effected by the growth of tissue from the sides of the cloaca and downward from the point where the rectum and the urachus unite. By the formation of this septum the sinus urogenitalis is separated from the rectum (Fig. 32). This partition unites with the posterior end of the genital folds (see Fig. 34), and thus the separation between the genito-urinary and the anal openings is completed by the formation of the perineum, which takes place in the tenth week.

FIG. 31.

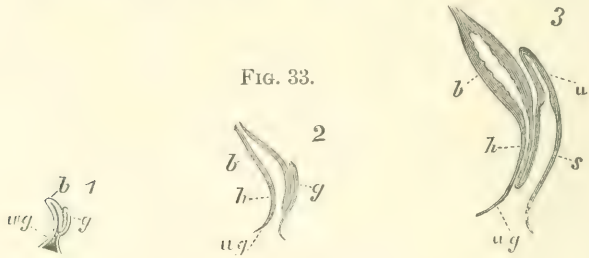
FIG. 31.—*cl*, cloaca; *all*, allantois; *m*, Müller's duct; *r*, rectum (Schroeder).

FIG. 32.

FIG. 32.—*su*, sinus urogenitalis; *r*, rectum, separated by the perineum; *v*, vagina, lower part of Müller's duct; *b*, bladder; *u*, urethra (Schroeder).

The sinus urogenitalis lags behind in growth, while the urethra is being formed as a distinct part, different from the bladder, with which it hitherto has been blended into one organ, the urachus, and the uterus and vagina are being developed from the lower part of the Müllerian ducts. (See Fig. 33, 2.) Actual measurements at different stages of development prove that the sinus urogenitalis increases in size, so that its apparent diminution is only due to the comparatively greater development of the surrounding parts. In consequence of the considerable

FIG. 33.



Sinus Urogenitalis and its Appendages from Human Embryos (in life-size): 1, from a three months' fœtus; 2, from a four months'; 3, from a sixth months'; *b*, bladder; *h*, urethra; *ug*, sinus urogenitalis; *g*, genital canal, common rudiment of vagina and uterus; *s*, vagina; *u*, uterus (Kölliker).

growth of the vagina the sinus urogenitalis, which at an earlier stage appeared to be the continuation of the bladder, becomes the direct continuation of the vagina and forms the vestibule.

At first the uterus and the vagina form only one organ, without any line of demarkation between the two, as seen in Fig. 33, 1 and 2, representing embryos of the third and the fourth month. In the fifth, and still more distinctly in the sixth month, the uterus becomes separated from the vagina by the formation of a ring protruding from the inner surface at the level of the future external os (see Fig. 33, 3); which ring, by further development during the remaining months of pregnancy, becomes the vaginal portion.

In the fifth month the uterine wall is scarcely thicker than that of the vagina, but from the sixth month it increases considerably in thickness. Transverse folds appear in the fifth month, designating the cervix.

In the newborn child the cervix constitutes about two-thirds of the whole length of the organ, and its walls are much thicker than those of the body. In a specimen lying before me the exact outer measures are—cervix, 2.2 centimeters; body, 1.0; wall of cervix, 0.3. On the outer surface there is no distinct line of demarkation between the cervix and the body. The lower part forms a cone the base of which points down toward the vagina, and the shape of which is such that a cross-cut made perpendicularly on the long axis almost forms a circle. The body, on the other hand, has the shape of a flattened cone, the basis

of which is turned upward to the abdominal cavity; but this triangular flat part extends somewhat lower down than the internal line of demarkation between the cervix and the body, and on the anterior surface the peritoneum descends almost as far down below the internal line of demarkation (nine millimeters) as the whole length of the body. On the internal surface the line of demarkation is very sharp on the anterior surface. The anterior column, from which numerous rugæ go off to both sides under acute angles tending outward and upward, ends abruptly at a deep transverse furrow which separates it from the cavity of the body. The whole anterior surface of the cavity of the body, from this furrow up to the fundus, is occupied by two large bundles of longitudinal furrows, each of which forms a lengthy, narrow triangle, touching the fundus with their base. A similar formation is found on the posterior wall, but here the line of demarkation between the transverse folds of the cervix and the longitudinal folds of the body is less distinct. In both edges of the cavity of the body is found a fine longitudinal ridge from which start to both sides fine transverse folds ending at the longitudinal folds on the anterior and posterior surfaces. They are a direct continuation of the transverse folds found in the cervix.[1]

Later in life all these folds of the cavity of the body disappear. In a figure in Courty's treatise of the diseases of the uterus, representing the normal uterus of a girl of seven years, the folds are already limited to the cervix. The fundus in the newborn forms a straight line from one tube to the other. The whole organ is slightly curved forward, but there is no anteflexion; that is to say, the axis of the organ does not form any angle. According to Kölliker, some uteri from the end of embryonic life, and during childhood up to the age of puberty, present a slight degree of anteflexion. After that time the normal uterus is straight.

The mucous membrane of newborn children has no true glands, but only follicular depressions.[2] The formation of glands begins much earlier in the cervix than in the body. Thus in the body of the uterus of a girl of six or seven years there are barely found at long intervals some epithelial invaginations which only penetrate to a short distance into the stroma of the mucous membrane, constituting rudimentary glands. At the same time, those of the cervix are perfectly developed, and have even almost acquired the size they obtain in the adult (De Sinéty). It is true that even in the newborn child we find the cervical canal filled with a thick colorless mucus, as in the adult, but this is

[1] This description of the cavity of the uterus with *longitudinal* folds differs entirely from the common one, according to which the transverse folds of the cervix should be continued on the anterior and posterior wall up to the fundus; but on the other hand, it comes pretty near to the description, and especially the drawing, of Hagemann, who injected the cavity with a soft metallic composition or paraffin.

[2] Cornil, *Journal de l'Anatomie*, 1874, quoted by Imbert.

merely a secretion from the calciform or cup-shaped epithelial cells found on the folds of the cervix. During the years elapsing between the birth of the child and its arrival at puberty the uterus stays much behind the rest of the body in development—so much so that in a girl of ten or twelve years it scarcely differs in external appearance from that of a newborn child (Puech). But at the time of approaching menstruation the organ increases much in size—an increase which goes on till the general growth of the body reaches its maximum.

The *vagina*, after the differentiation between it and the uterus has taken place in the fifth month, becomes much wider than the uterus, and about the middle of utero-gestation its folds make their appearance.

The *hymen*[1] is not, as stated in most books, a mere fold of the mucous membrane of the vagina, but, as demonstrated by dissections made by Budin, the whole lower end of this canal dipping into the vestibule. It is only a further development of the ring-shaped swelling with which the Müllerian ducts are surrounded where they open into the sinus urogenitalis. This development does not begin before the nineteenth week. As a rule, a larger part of the posterior wall protrudes than of the anterior. The internal or upper surface shows a continuation of the vaginal columns and folds. The vagina in young individuals has the shape of the finger of a glove, with a small round opening or lengthy slit at the end, which is the true entrance of the vagina.

The Vulva.[2]

As stated above, at an early stage of embryonic development the intestine and the bladder open into a common space called the cloaca, which from the fourth week communicates with the outer surface by means of an aperture called the primitive anal or cloacal opening. In front of this opening there appears in the sixth week a protuberance called the genital eminence, and soon thereafter two lateral folds called the genital folds (Fig. 34). The genital eminence protrudes more and more, and toward the end of the second month a furrow appears on its lower surface extending to the outlet of the cloaca, the so-called genital furrow. From the fifth to the tenth week the cloaca becomes separated, as described above, into an anterior or urogenital part, the sinus urogenitalis, and a posterior or rectal part. Up to the tenth week the sexes cannot be distinguished, but henceforth the peculiarities of each appear. The genital folds grow to be the labia majora;[3] the edges of

[1] Although it would be gratifying to the æsthetic and moral sense to put this word in a particular relation to Hymen, the god of marriage, it simply means a membrane (ὑμήν).

[2] Classic Latin, but in ancient times often comprising the whole genital canal.

[3] Latin, *labium*, lip.

the genital furrow are developed as the labia minora; and the genital eminence becomes the clitoris,[1] round which is thrown a fold from the labia minora forming its prepuce.[2] The sinus urogenitalis remains in the shape of the vestibule. The posterior part of the genital folds

FIG. 34.

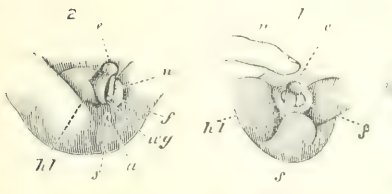


FIG. 35.

FIG. 34.—Formation of the External Genitals in Mankind. 1, lower portion of the trunk of an embryo from the eighth week, double size; *e*, gland or point of the genital eminence; *f*, genital furrow leading back to an aperture which at this period communicates with the rectum, and consequently is a cloacal opening; *hl*, genital folds; *s*, caudal extremity of the body; *n*, umbilical cord. 2, from a Female Embryo about 10 weeks old and 1 inch and 2 lines long: *a*, anus; *ug*, entrance to sinus urogenitalis; *n*, edges of genital furrow or labia minora. The other letters as in 1 (Kölliker).

FIG. 35.—1, from an Embryo 1 inch long, double size, representing a stage that precedes Fig. 34; 2, the sex is not yet distinguishable. 2, from a Male Embryo from the end of the third month, 2 inches and 1½ lines long. Letters as in Fig. 34. In 2 the genital furrow is closed, forming the raphé (*r*) of the penis, scrotum, and perineum (Kölliker).

grow together, forming the perineum,[3] which above unites with the partition which has divided the cloaca into two distinct cavities.

Literature Referred to.

BOEHM, C.: "Ueber Erkrankung der Gartnerschen Gänge" (*Arch. f. Gynäk.*, 1883, vol. xxi. p. 176).

BUDIN, P.: "Recherches sur l'Hymen et l'Ouverture du Vagin" (*Progrès médical*, 1879, Nos. 35, 36, 37, and 38).

CHAUVAU: *Anatomie comparée des Animaux domestiques*, 3d ed., Paris, 1879.

COURTY, A.: *Traité pratique des Maladies de l'Utérus et de ses Annexes*, Paris, 1866.

DOHRN, R.: "Ein Fall von Atresia vaginalis" (*Archiv für Gynäk.*, x. p. 544).

———: "Die Gartnerschen Kanäle beim Weibe" (*Arch. für Gynäk.*, 1883, vol. xxi. p. 328).

FISCHEL, W.: "Ueber das Vorkommen von Resten des Wolffschen Ganges in der Vaginalportion" (*Arch. für Gynäk.*, 1884, vol. xxiv. p. 119).

FOULIS: "Cancer of the Ovary" *Edinburgh Med. Journ.*, March, 1875.

GARTNER, H. T.: "Anatomisk Beskrivelse over et ved nogle Dyrearters Uterus undersögt glandulöst Organ" (*Kongl. Dansk. Videnskr. Selsk. Skrifter*, Copenhagen, 1822).

GEIGEL, R.: *Ueber Variabilität in der Entwickelung der Geschlechtsorgane*, Würzburg, 1883.

HAGEMANN: "Ueber die Form der Höhlung des Uterus" (*Arch. für Gynäk.*, 1873, vol. v. p. 295).

HEDENIUS, P.: "Ett fall af uterus septus med en ensidig kongenital atresi" (*Upsala Läkareförenings Förhandlingar*, 1882, vol. xvii. p. 530).

[1] Classic Greek, κλειτορίς.
[2] Classic Latin. *præputium*.
[3] Classic Greek, περίνεον or περίναιον.

His, Wilhelm: *Anatomie menschlicher Embryonen*, i.–iii., Leipzig, 1880–85.

Imbert, G.: *Développement de l'Utérus et du Vagin*, Paris, 1883.

Jacobson, L.: *Die Okenschen Körper oder die Primordialnieren*, Kopenhagen, 1830.

Kocks, J.: "Die Gartnerschen Gänge beim Weibe" (*Archiv für Gynäkologie*, 1882, vol. xx. p. 485).

Kölliker, A.: *Entwickelungsgeschichte des Menschen und der höheren Thiere*, 2te Auflage, Leipzig, 1879.

———: *Ueber die Lage der weiblichen innern Geschlechtsorgane*, Bonn, 1882.

———: "Organe junger menschlicher Embryonen" (*Centralbl. für Gynäk.*, 1884, vol. viii. p. 585).

Meyer, H.: "Ueber die Entwickelung der menschlichen Eierstöcke" (*Arch. für Gynäk.*, 1884, vol. xxiii. No. 2, p. 226).

Milne-Edwards, H.: *Leçons de Physiologie et d'Anatomie comparée*, vols. viii. and ix., Paris, 1870.

Puech, A.: *Des Ovaires, de leurs Anomalies*, Paris, 1873.

Quain: *Elements of Anatomy*, edited by Allen Thomson, E. A. Shäfer, and G. D. Thane, 9th ed., New York, 1882.

Rieder, Carl: "Ueber die Gartnerschen (Wolffschen) Kanäle beim menschlichen Weibe" (*Virchow's Arch.*, vol. xcvi. p. 100).

Schatz, F.: Vier neue Fälle von unvollkommener Theilung des weiblichen Genitalkanals (*Arch. für Gynäk.*, 1870, vol. i. p. 12).

Sinéty, L. De: *Manuel pratique de Gynécologie*, Paris, 1879.

Skene, A.: "The Anatomy and Pathology of Two Important Glands of the Female Urethra" (*Am. Journ. Obst.*, 1880, vol. xiii. p. 265).

Waldeyer, W.: *Eierstöck und Ei*, Leipzig, 1870.

Wassiliieff, M.: "Betreffend die Rudimente der Wolffschen Gänge beim Weibe" (*Arch. f. Gynäk.*, 1884, vol. xxii. p. 346).

Winckel, T.: "Die Krankheiten der weiblichen Harnröhre und Blase," Stuttgart, 1877 (*Billroth's Handbuch der Frauenkr.*, vol. iii. part ix.).

THE ANATOMY OF THE FEMALE PELVIC ORGANS.

By HENRY C. COE, M. D., M. R. C. S.,
New York.

Introductory.—In venturing upon ground which has been so frequently trodden the writer would disclaim, at the outset, such an amount of original research as would entitle him to speak authoritatively upon any one of the many disputed questions which will arise in the course of the following studies. If, then, some mooted points are left undecided, it may be assumed, without further explanation, that the writer feels himself incompetent to settle them.

It is intended in this article to avoid such details as would be interesting only to the anatomist, and to present a brief and fairly accurate review of the pelvic organs as regarded from the standpoint of practical gynecology. The general reader, who has hitherto been content to limit his knowledge of pelvic anatomy to the half-dozen introductory pages in a textbook on obstetrics or diseases of women, will be surprised, on looking deeper into the subject, not so much at the unsolved problems that confront him on every side, as at the number of erroneous statements that have long received the sanction of the highest authorities.

In describing in detail the organs of generation there are several orders in which they may be considered. Thus they may be studied—1, in the order of their development; 2, according to their relative importance, or from within outward; 3, from without inward. The latter sequence, which is the one usually followed, is the most natural one, since we not only begin with the study of simpler structures and ascend gradually to those of greater complexity, but we observe the same order as in a systematic examination of the organs in the living subject.

It is customary to speak of the external and the internal genitals. The vagina is commonly included among the former, although not properly. It is better to describe it by itself as a connecting-link between the external, or visible, and the internal, or deep-seated, organs. The hymen is invariably described with the pudenda, when,

as will be shown later, it is strictly a part of the vagina, and should be considered with that canal.

THE EXTERNAL GENITALS.

Synonyms.—Vulva[1]; *Lat.*, pudenda, cunnus; *Fr.*, vulve, parties génitales externes; *Ger.*, Schamritze, Schamtheile; *It.*, vulva, pudende; *Sp.*, vulva, pudendum.

Definition.—Under this term is included that portion of the genital tract which is visible externally.[2]

It should be added that this definition implies that the subject is placed in the recumbent posture, with the thighs abducted and the labia majora separated. In the nude erect female the mons Veneris alone is

Fig. 36.

The External Genitals, as seen in mesial section (Henle): *a*, anus; *b*, perineal body; *c*, vagina; *d*, urethra; *e*, labium minus; *f*, clitoris; *g*, fossa navicularis, in front of which is the hymen.

visible (Fig. 36). The external genitals include the greater and lesser labia and the clitoris, with the parts immediately adjacent to them. The meatus urinarius belongs to the urinary tract, with which it will be described. Certain accessory structures, such as the bulbs of the vagina and the glands of Bartholin, may be regarded as common to both the vulva and vagina, while the pad of fat over the symphysis pubis, known as the mons Veneris, has no function whatever in connection with generation,[3] but will be mentioned first on account of its architectural prominence.

[1] "Le vulve est l'ensemble des parties génitales externes de la femme;" so Quain's *Anatomy*, last ed.: "All the parts perceptible externally."

[2] The term "vulva" is not sufficiently exact, since it has been applied by some writers to the rima pudendi, by others to all the parts surrounding the entrance to the vagina and situated anterior to the hymen or caruncles. Etymologically, the vulva (valvula) includes the greater labia only; and this was its original meaning, according to ancient writers.

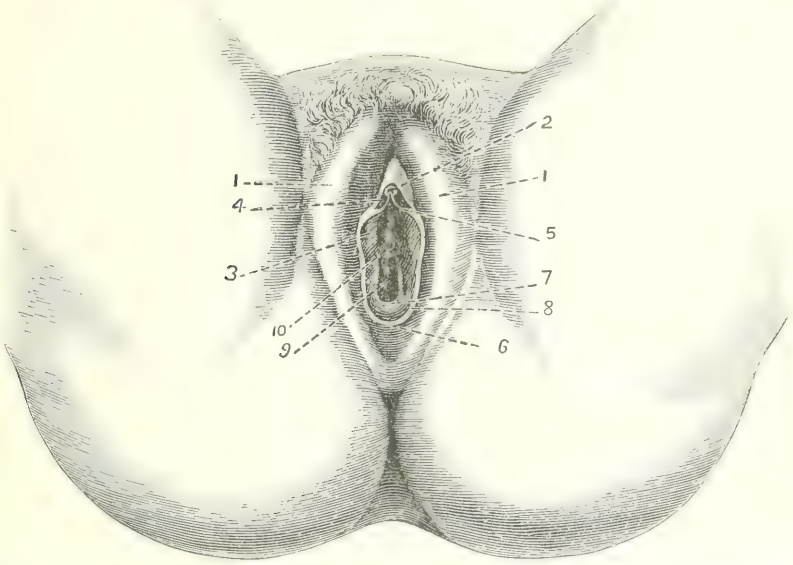
[3] Comp. Tarnier, Charpentier, and Tillaux.

Mons Veneris.

Synonyms.—"Mount of love;" *Fr.*, mont de Vénus, pénil, éminence sus-pubienne; *Ger.*, Schamhügel; *It.*, monte di Venere; *Sp.*, monte de Venus.

Definition.—The mons is a somewhat triangular area or projection

Fig. 37.



The External Organs of Generation (Luschka): 1, 1, labia majora; 2, glans clitoridis; 3, the nymphæ; 4, præputium clitoridis; 5, frænulum clitoridis; 6, frænulum nympharum; 6, hymen; 8, orifice of the glands of Duverney; 9, tuberculum vaginæ; 10, meatus urethræ.

situated in front of the symphysis pubis. It is covered with a thick growth of coarse hair.

The triangular area mentioned is continuous at its apex with the upper extremities of the labia majora, while its base is defined by a groove at the lower limit of the hypogastrium, which is more or less sharply defined according to the amount of adipose tissue in the abdominal wall. Laterally, the elevation melts away gradually toward the inguinal folds, which form its extreme lateral boundaries. The mons cannot be regarded as in any sense an independent structure, since it is merely an imperfectly circumscribed collection of fat, supported by connective tissue, varying in prominence in different subjects. The integument over this region is thicker than that covering the rest of the abdomen, while the hair is coarser and more crisp than that found elsewhere in the body, and has a decided tendency to curl. Its color will be found to correspond quite closely with that which is natural to the peculiar type of individual in which it is observed, but it is

frequently several shades darker than the hair of the head, especially in brunettes. Appearing at puberty, this hair reaches a certain stage of development, at which it persists through life. It is rather late in undergoing the senile change. It may be stated as a curious, rather than an important, fact that the upper limit of the hairy growth on the external genitals of the female is rather sharply defined by the groove before mentioned. It is rare to find a line of hair following the course of the linea alba as high as the umbilicus, a distribution commonly observed in the male. Among five or six hundred women in the lying-in wards of the Vienna General Hospital, whose abdomens the writer inspected with the view of collecting data bearing on this point, not over half a dozen presented the hirsute development described, and these were subjects of a decidedly masculine type.

ANATOMY.—A. *Gross.*—This projection, as before stated, is essentially a cushion of adipose tissue traversed by interlacing fibrous and elastic bands, and covered by the skin and superficial fasciæ which are common to the abdominal wall. The skin is thick and has an oily feel, the latter peculiarity being due to the presence in it of numerous sebaceous glands. On removing the integument a delicate layer of fascia is seen, which is continuous with the superficial fasciæ of both the abdomen and thighs. This layer is separated with difficulty, since it is traversed by elastic fibres which come from the subjacent tissue, where they form a close network. Certain bundles of these fibres have a definite direction, and have been differentiated by Broca in his description of the *sac dartoïque* ("pudendal sac" of Savage[1]). Thus, some extend laterally as far as the borders of the external inguinal rings; another set enter the suspensory ligament of the clitoris, and others blend with the elastic tissue of the labia majora. The terminal fibrils of the round ligaments may be traced by careful dissection into the midst of the fibro-lipomatous tissue of the mons. As will be inferred from the above description, the fat composing the mons is arranged in the form of lobules, separated by fibrous trabeculæ, and it does not appear as a diffuse mass.

B. *Minute.*—The microscopic anatomy of the suprapubic region may be dismissed in a few words, since it is identical with that of any other portion of the skin, plus an extra amount of adipose. Hair-bulbs, sebaceous, and sweat-glands will be seen in a cross-section; the existence of the latter structures has been questioned, though without sufficient reason.

LABIA MAJORA.

SYNONYMS.—Greater, or external labia, lips of the vulva; *Lat.*, labia externa, seu cunni, seu pudendi, alæ majores, etc.; *Fr.*, grandes lèvres,

[1] *Anatomy of Female Pelvic Organs.*

lèvres de la vulve; *Ger.*, grosse Schamlippen; *It.*, grandi labbra; *Sp.*, labios mayores.

DEFINITION.—The labia majora are two cutaneous folds which begin at the lower part of the mons Veneris, extend downward and backward on either side of the vulvar cleft, and terminate by blending with the integument of the perineum. Luschka[1] has shown that there is no well-marked line of separation between the opposite labia, and hence that the expressions "anterior" and "posterior" commissures, so far as they convey the idea of connecting bands, are incorrect.[2] By the anterior commissure we understand simply a median projection situated from one to one and a half centimeters above the clitoris; it represents the point of fusion of the labia with the mons Veneris, and forms the anterior or upper extremity of the rima. The posterior commissure is still less distinct, and only appears as a band when the labia are widely separated. It is a *region*, rather than a well-defined *bridge of skin;* it is not possible to identify the exact point at which either labium ends and the perineum begins. The prevailing inaccuracy in the description of the posterior commissure has led to a similar looseness of expression with regard to the antero-posterior extent of the perineum, which is commonly represented as stretching from the anus to the posterior commissure, instead of to the lower edge of the vulvar orifice.[3]

Gross Appearance.—The cross-section of a labium is somewhat triangular in shape, so that we may regard each labium as possessing three sides—a base, which rests upon (but is not attached to) the ramus of the pubes, and two surfaces, an external and an internal. The external surface is convex, rugose, and bears a resemblance to the scrotum, of which it is considered the analogue. The integument is similar to that covering the mons, and has a growth of hair continuous with that of the pubic eminence, while its sebaceous glands are so large that their openings are visible to the naked eye. This surface is limited externally by the genito-crural fold.

The inner surfaces of well-rounded labia, especially in the virgin, are always in contact, except when the thighs are strongly abducted. They are normally smooth, soft, and of a reddish color, offering a decided contrast to the outer surfaces. Scattered hairs of a fine, downy character are apparent on close inspection.

The labia are subject to variations both in size and in degree of approximation. In young, well-developed subjects they are firm, plump, and are so closely in contact as to entirely conceal the parts

[1] *Anatomie des menschlichen Beckens*, p. 407.

[2] Equally questionable is the statement of Hart and Barbour, that "they form by their junction—the anterior commissure—the structure known as the mons Veneris" (*Gynæcology*, p. 46).

[3] Comp. Savage's definition of the perineal body, *Female Pelvic Organs*, pl. i., text.

behind them (vulva connivens). With the disappearance of their adipose tissue, a change which occurs normally in old age, they become flabby and pendulous and no longer cover the nymphæ. The appearance presented by such gaping labia, as observed with the subject in the dorsal position, was designated by the older anatomists as the vulva hians. It should be added that the vulvar cleft is equally exposed in the fœtus, but the condition here is to be ascribed to the incomplete development of the greater labia.

Anatomy.—A. *Gross.*—The structure of the labia is similar to that of the mons, so far as regards their integument, adipose, and elastic tissue; but the latter assumes more importance here, and deserves our careful consideration. A layer of fat, of variable thickness, lies just beneath the skin. It is most abundant near the mons and toward the external surface, but fades away toward the posterior commissure and internal surface. The elastic fibres may be divided into superficial and deep bundles, the former appearing as a thin stratum continuous with the deep layer of the superficial perineal fascia. Sappey describes in it smooth muscular fibres, and compares it to the dartos. The deeper bundles of elastic tissue were originally described by Broca, who distinguished four main groups, one of which, he says, comes from the mons, and others from the borders of the external ring and from the pubic rami. The disposition of the elastic tissue of each labium in the form of a sac, having its neck at the external ring and its fundus just above the posterior commissure, was described by the same author. This structure, which practically includes the entire labium except the integument, is, as Savage admits, rarely defined save in cases of labial hernia. It is really formed by the superficial layer of elastic tissue (that continuous with the perineal fascia) which is attached around the margin of the ring. Within the sac are the deeper fibres, forming a network in the midst of a quantity of adipose tissue, as in the mons. If this is followed up to its junction with the mons, the lower terminal fibres of the round ligament will be found. In the neck of the sac will occasionally be seen the persistent process of peritoneum known as the canal of Nuck. The labia derive their arterial supply from the superficial perineal branch of the internal pudic. The veins form rich plexuses in the subcutaneous tissue, finally communicating with the vaginal bulbs, and accompany the arteries: the lymphatics enter the superficial inguinal glands, following the course of the external pudic artery, as do those of the scrotum. The nerves are the superficial perineal branches of the internal pudic and the inferior branch of the small sciatic.

B. *Minute.*—The skin of the labia is distinguished by the unusual size of its hair-bulbs and sebaceous glands. Sweat-glands are also present. The hair-follicles gradually disappear toward the inner sur-

face, but the glands persist. For a description of the papillæ, the distribution of the blood-vessels, and the ultimate terminations of the nerves the reader is referred to the chapter on the skin in any work on normal histology. There is nothing peculiar in the minute anatomy of the fibrous and adipose tissue.

It is difficult to conceive how any writer can affirm of the labia that "the inner surface is in all respects like a mucous membrane, except that it possesses sebaceous glands in place of mucous follicles."[1]

Labia Minora.

Synonyms.—Lesser labia, nymphæ; *Lat.*, labia pudendi minora, seu interna, alæ minores; *Fr.*, petites lèvres, nymphes; *Ger.*, kleine Schamlippen; *It.*, piccole labbra; *Sp.*, pequeños labios.

Definition.—The labia minora are two muco-cutaneous folds or flaps which are situated between the labia majora, from the inner surfaces of which they appear to spring. The nymphæ are ordinarily described as "two reddish folds of mucous membrane."[2] Hart asserts, confidently, that "they are skin, thin and fine, and not mucous membrane, as often alleged."[3] The writer is not prepared to accept this latter statement without qualification, at least with regard to the labia minora in the virgin, which are always covered by the external parts. Their outer surfaces may indeed be regarded as true skin, but the internal approach so closely to the character of mucous membrane that the difference between the two is inappreciable. It is only when the nymphæ have been long exposed by the separation of the labia majora that their inner surfaces assume the appearance of integument. The writer suggests the adjective "muco-cutaneous" as a compromise. The subject will become more intelligible after the reader has studied the minute structure of the tissues.

Gross Appearance.—These folds are usually symmetrical, although one is sometimes a little larger than the other. They are of a rose-red hue in the virgin, but may become of a dark-blue or slaty color during pregnancy or after they have been long exposed. Their general appearance has been aptly compared to that of a cock's comb. Beginning just below the anterior commissure, the nymphæ appear as double folds which meet above and below the clitoris, forming respectively the prepuce and frænulum of the clitoris; they then descend on each side of the vestibule, along the base of the inner surface of the labium, with which they apparently blend at about its middle. They are not lost

[1] Lusk, *Science and Art of Midwifery*, 1st ed. p. 3—corrected in last edition.

[2] *Op. cit.*, p. 4; Ramsey, *Topographical Relations of Female Pelvic Organs*, p. 67.

[3] Hart and Barbour, *Gynæcology*, p. 6; also, Hart, in *Edinburgh Med. Journal* for Sept., 1882.

here, however, but reappear at the lower extremity of the vulva, where they are united by a thin muco-cutaneous commissure known as the fourchette, or frænulum vulvæ:[1] in fact, they are sometimes prolonged so as to encircle the entire orifice. These folds are entirely concealed in the virgin, being only exposed when the external labia are widely separated. They are quite prominent in the fœtus, because of their relatively advanced development, and in the aged by reason of the gaping vulva.

Fourchette.—This is a delicate fold of skin (or skin and mucous membrane?) which unites the posterior extremities of the nymphæ. It is situated in front of the posterior commissure, being distant from the anus 2.7 cm. in nulliparæ, and 2.5 cm. in women who have borne children.[2] Its persistence in the latter is by no means so uncommon as most writers affirm. The fourchette occupies a different position according as the nymphæ are in contact or are artificially separated. Under the former conditions it is but faintly marked as a loose fold between the hymen and the posterior commissure; but when the nymphæ are drawn apart it appears as a tense band, separated from the posterior border of the ostium vaginæ (or, more properly, from the lower portion of the hymen) by a depression which, from a fancied resemblance, has been termed the fossa navicularis. It should be clearly understood that this fossa is *not* a natural depression, but is produced artificially when the fourchette is put on the stretch by lateral traction.[3] The subject being supine, it is bounded in front by the inner surface of the fourchette, behind by the anterior surface of the hymen, while its base rests upon the perineal body.

The writer has frequently identified the line mentioned by Hart and Barbour, which, according to these writers, forms as sharp a limit between skin and mucous membrane as the well-known "white line" at the anal orifice. This line of separation is described as running along the bases of the internal aspects of the nymphæ, and crossing between the two below the prepuce of the clitoris in front and at the base of the outer aspect of the hymen posteriorly.

Anatomy.—A. *Gross.*—Without attempting to discuss this disputed subject at length, we shall assume that the labia minora consist essentially of delicate skin, which on their inner surfaces passes over insensibly into a sort of transitional tissue, the character of which differs

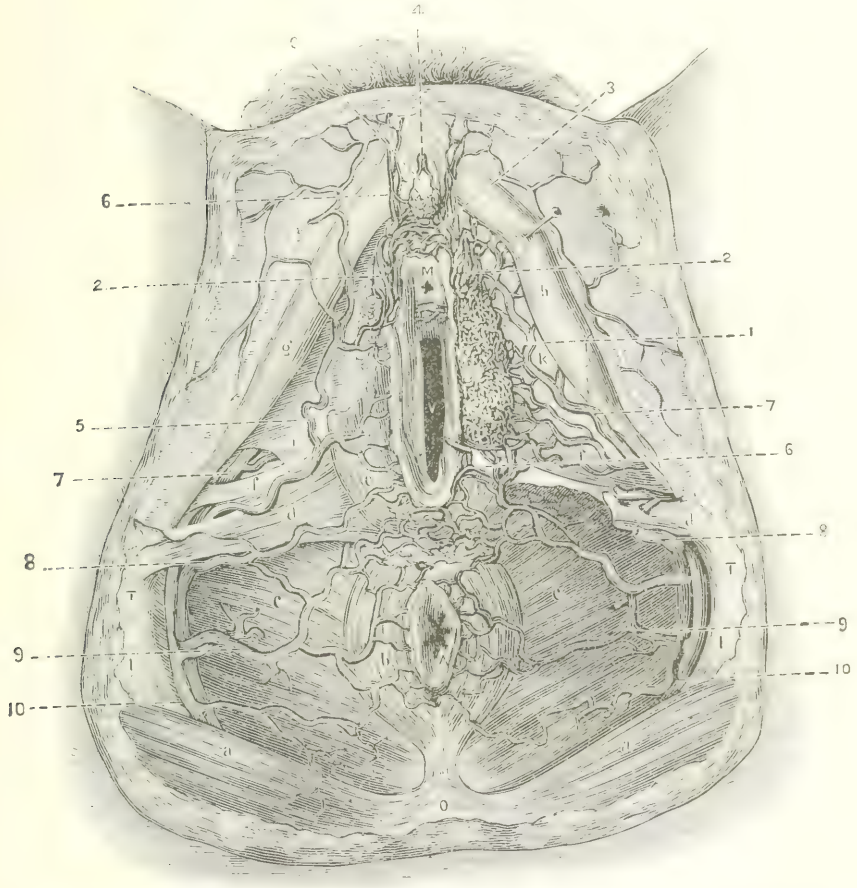
[1] Luschka was the first who called attention to the fact that the fourchette unites the lesser, and not the greater, labia (*op. cit.*, p. 403). Hart and Barbour are, strangely enough, at variance with him (*op. cit.*, p. 6).

[2] Foster, "Topographical Anatomy of the Uterus and its Surroundings," *Am. Journ. Obstet.*, vol. xiii., Jan., 1880.

[3] Ranney is correct in his criticism of the statement made by Hart and Barbour, that "when the fourchette is *pulled down* by the finger a boat-shaped cavity is made—the fossa navicularis" (*op. cit.*, p. 66).

in different subjects. While it may sometimes be regarded as true skin, the limit of which is defined by the line before described, it can, on the other hand, rarely be considered as true mucous membrane, such as that which lines the genital canals. The writer believes that it will even-

FIG. 38.



The Superficial Veins of the Perineum (Savage): *h*, *g*, crura clitoridis: *C*, corpus clitoridis: 1, 2, 3, corpus cavernosum urethræ; 4, superior perineal and obturator veins; 6, veins of communication with superficial epigastric veins: 8, 9, 10, pudic vein and primary branches; *M*, urethral meatus; *V*, vaginal aperture: *A*, anus; *T*, tuberosity of ischium: *O*, coccyx: *G*, vulvo-vaginal gland; *a*, anterior border of gluteus maximus muscle; *b*, superficial sphincter ani muscle; *c*, *c*, pubo- and obturator coccygeus muscle, closing upward the posterior perineal space bounded by the coccyx, *O*: lower border of gluteus, *a*; larger sciatic ligament, *L*; tuberosity of the ischium, *T*; superficial muscles, *d*, *d*; and inferior border of perineal septum, *f*; *e*, bulbo-cavernosus muscle; *i*, anterior aponeurosis, and *k*, posterior aponeurosis, of perineal septum; *g*, erector clitoridis muscle; *h*, left crus clitoridis.

tually be shown that the Edinburgh anatomist is correct in his statement, but as yet the evidence is not wholly conclusive. We are at

least justified in affirming that the nymphæ are *not* "folds of mucous membrane."[1]

The subcutaneous tissue of the nymphæ is entirely devoid of that fat which forms such a prominent part of the labia majora. It consists almost entirely of a fibro-elastic framework supporting a rich venous plexus, in the meshes of which are bundles of smooth muscular fibres. It is questionable if we are justified in regarding this, with Gassenbaur, as a variety of cavernous tissue. Kobelt[2] excludes the nymphæ from the class of erectile structures.

The arterial supply of the lesser is derived from the same source as that of the greater labia (internal pudic). The large venous plexuses not only empty into affluent vessels which enter the pudic vein, but communicate freely with the vaginal bulbs and with the perineal veins,[3] thus forming a link between the pelvic and perineal systems. The nerves and lymphatics are common to both the labia majora and minora.

B. *Minute.*—A cross-section of one of the nymphæ presents the following appearances: The free surface is covered with several layers of stratified epithelium, the lowermost cells containing pigment-granules. Beneath the epithelium is the connective-tissue basis, which consists of interlacing fibres, some of which are elastic. Bundles of smooth muscular fibres will be recognized by their large fusiform cells; the latter will be found in greatest numbers along the course of the vessels. The fibrous tissue forms numerous papillæ, which project into the epithelial layer and are provided with vascular loops, the veinlets returning from which enter the plexuses before alluded to. A superficial capillary network immediately below the epithelium has also been described. The peculiar nerve-termination described by Krause as "end-bulbs" are also seen in the papillæ. One striking feature in the minute anatomy of the nymphæ is the presence in them of large sebaceous glands, which open upon the free surface. According to some authorities, these are confined to the outer aspect of the labium;[4] they are said to be absent at birth. It is generally agreed that hairs are entirely absent from the labia minora: this is rather a curious fact when taken

[1] There is no profit in pursuing this discussion farther here, since it resolves itself merely into an expression of personal opinion. Most authorities in histology, it must be admitted, describe the labia minora (when they describe them at all) as genuine mucous folds. Klein characterizes them somewhat vaguely as "fibrous connective-tissue mucous membrane" (*Elements of Histology*, p. 270).

[2] *Die Männlichen u. Weiblichen Wollust-Organe des Menschen.*

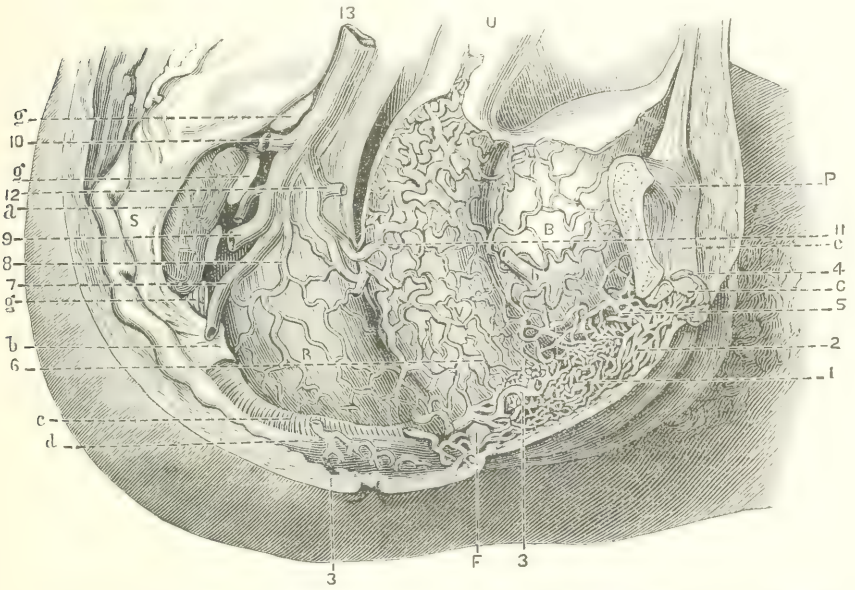
[3] No description can convey any idea of the vascular richness of these parts which can compare with Savage's plates (pls. vi., vii.). The reader must bear in mind that it is only in very successful special injections that the venous plexuses can be traced continuously.

[4] Satterthwaite, *Manual of Histology*, chap. xvi.

in connection with the presence of the glands, since the two are usually inseparable.[1] The latter furnish a strong argument in favor of the tegumentary character of the labia.

As to the venous plexuses, it may be added that, in spite of their free communication and the elastic tissue in which they run, we can

FIG. 39.



The Venous Plexuses of the Vagina and Vulva, as seen in mesial section (Savage): *B*, bladder, partially inflated; *b*, ureter; *V*, vagina; *P*, section of pubis; *R*, rectum; *C*, clitoris; 1, bulb; 2, its urethral venous process; 3, lower efferent veins; 4, dorsal vein of the clitoris; 5, urethral venous plexus; 6, commencement of vaginal venous plexus; 7, 8, 9, 10, sciatic and gluteal veins; 11, uterine veins; 12, obturator vein; 13, internal iliac vein; *a*, pyriformis muscle; *b*, larger sciatic ligament; *c*, pubo- and obturato- and ischio-coccygeal muscles; *e*, suspensory ligament of the clitoris; F, bulbo-vaginal gland; *g*, *g*, *g*, *g*, roots of sacral plexus of nerves.

hardly regard them as sufficiently large and intimately connected with the terminal arteries to justify the application of the term "erectile" to this tissue.[2]

The minute anatomy of the fourchette is similar to that of the nymphæ. Ramey[3] states confidently that its inner surface, "since it possesses minute hairs, is considered as properly belonging to integumentary structures:" the latter clause may be true, although the former is questionable.

[1] Quain's *Anatomy*, 9th ed., vol. ii. p. 256.

[2] Compare the definition of "erectile tissue" in Quain's *Anatomy*, 8th ed., vol. ii. p. 180.

[3] *Top. Relations of Female Pelv. Organs*, p. 65.

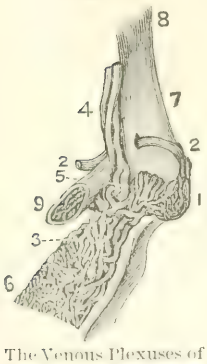
Clitoris.

Synonyms.—*Gr.*, Κλειτορις; *Lat.*, penis muliebris, membrum muliebre; *Fr.*, clitoris; *Ger.*, Kitzler; *It.*, clitoride; *Sp.*, clitoris.

Definition.—A small, curved, oblong organ, the analogue of the penis in the male, situated at the apex of the vestibule just below the anterior commissure.

As ordinarily seen, the clitoris (or rather its glans) appears as a small pea-shaped projection hidden between the diverging folds of the labia minora. It is only when the latter are widely separated that the end of the organ is seen. The reader whose attention has not been specially directed to the subject will be somewhat surprised at the actual size of the clitoris in the living female, since many of the descriptions and drawings in the textbooks must have led him to suppose that it actually resembles a small penis. Nothing could be more erroneous than this notion. The glans clitoridis, which is the only portion of the organ that we ever see normally, except in dissections, is in its most turgid condition merely a small projection, rarely larger than a small pea, and more often smaller. In some women it cannot even be discovered without a search. By bearing this fact in mind the relative insignificance of the clitoris when compared with the male organ will be intelligently appreciated. Of course, the apparent variations in the size and prominence of the former are explained to some extent by the thickness of the nymphæ. Although it has but a limited range of motion, during erection it becomes distinctly arched, the glans protrudes sensibly, while the body may be felt as a firm cord curving upward and backward until it is lost beneath the pubic arch.

Fig. 40.



The Venous Plexuses of the Clitoris (Savage): 1, nervous expansion on the blunt end of the clitoris; 2, dorsal vein of clitoris; 3, urethral venous process of bulb; 4, pubic communicating branches; 5, pars intermedia; 6, upper part of bulb; 7, suspensory ligament of clitoris; 9, section of right crus clitoridis.

Gross Appearance.—The component parts of the clitoris, as considered from before backward, are the glans, body, and crura. The attached folds of the nymphæ, known as the prepuce and frænulum, should properly be described in connection with the glans.

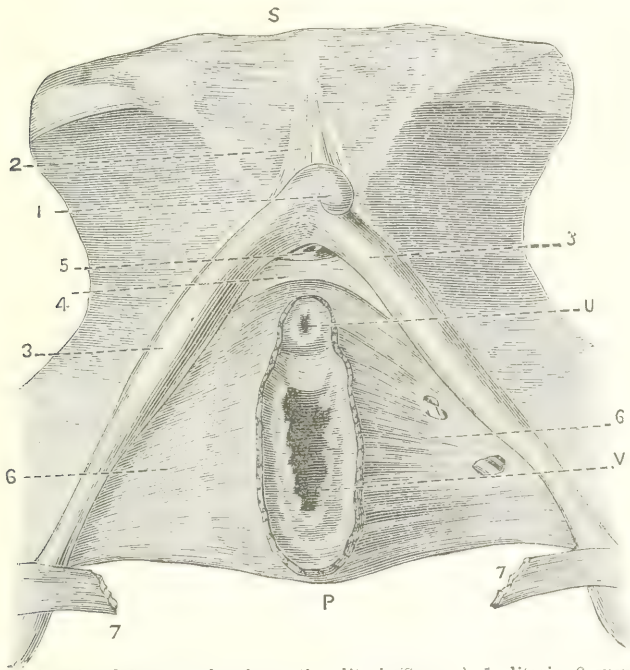
The glans clitoridis, which is the only portion of the organ visible without dissection, is a small mass of erectile tissue covered by mucous membrane (or skin?), which is partially enveloped by a sort of hood formed by the upper of the two folds into which the nymphæ divide (preputium clitoridis). The lower folds bend sharply inward to meet in the median line beneath the glans, to which they are attached, forming its frænulum[1] (Fig. 40).

[1] Hart and Barbour describe the frænulum as if it was the same as the suspensory

If the reader will remember the difference of opinion concerning the true character of the tissue covering the nymphæ, he will rightly infer that the same doubt exists as to whether the glans, with its frænulum and prepuce, is clothed with skin or with mucous membrane.[1]

The corpus clitoridis is a firm, cord-like body, seldom exceeding an inch[2] in length even when turgescent. It is situated in the median line in front of and below the symphysis pubis, and may be traced upward beneath the prepuce, and then backward to a point immediately under the anterior edge of the pubic arch, where it divides into the two crura (Fig. 41.) It is partly attached and partly dependent, the limit

FIG. 41.



Front View of Perineal Septum, showing entire clitoris (Savage): 1, clitoris; 2, suspensory ligament; 3, crura of clitoris; 4, subpubic ligament; 5, dorsal vein of clitoris; 6, perineal septum; 7, superficial transverse muscle; *U*, urethra; *V*, rectum and vagina; *P*, site of perineal body.

between the fixed and movable portions being defined by the point of insertion of the suspensory ligament. The latter is a small, but perfectly distinct, band of fibres which extends from the anterior aspect of

ligament of the clitoris (*Gynæcology*, p. 1). Ramsey says that the lower folds of the nymphæ "help to complete the suspensory ligament of the clitoris" (*op. cit.*, p. 67). This is certainly an error. In Quain's *Anatomy* (9th. ed., p. 700) we read: "There is a small suspensory ligament attached to the *upper* border, like that of the penis." This agrees with Savage's plate (pl. vi. Fig. 3) and with the writer's own dissections.

[1] Lusk (p. 3) speaks of the "cuticular covering of the glans" — an apparent inconsistency, as he considers the prepuce as a mucous fold.

[2] Quain says an inch and a half.

the symphysis (above its middle point) to the upper border of the posterior half of the corpus clitoridis. In front of its point of attachment the clitoris is somewhat dependent, like the penis, although its movements are further restrained by the frænulum.

The crura are two long, fusiform processes of spongy tissue, less than half an inch in diameter, which arise from the anterior borders and inner surfaces of the pubic and ischiatic rami, to which they are attached by firm connective tissue: they extend upward along the anterior edges of the ascending rami until they almost reach the symphysis, when they turn forward and coalesce beneath the arch to form the body. The inner side of each crus is covered by the slender erector clitoridis muscle (erector penis or ischio-cavernosus), which has its origin on the front of the tuber ischii, and its insertion by two separate tendinous expansions, "one above, where the crura join to form the clitoris—one in front and somewhat below."[1]

Anatomy.—A. *Gross.*—The clitoris consists essentially of cavernous tissue surrounded by a firm, fibrous covering (tunica albuginea), over which is an extremely sensitive tissue. Its gross resemblance to the penis, which is only partially apparent in the glans, is borne out in a longitudinal section of the body, which shows that it is composed of symmetrical halves (corpora cavernosa) separated by an imperfect or rudimentary septum pectiniforme. These corpora cavernosa are clearly the prolongations of the crura, which they resemble both in their gross and in their microscopic anatomy.

The spongy character of the tissue is apparent even to the naked eye: the trabeculæ look much finer than those of the male organ. The crura resemble unyielding fibrous cords, so that the presence in them of erectile tissue would never be suspected from an external examination. On section this tissue is found to occupy the central portion of each crus, and to disappear gradually toward the point of origin. It is covered by a thick fibrous layer of almost cartilaginous firmness, which gives to the body its cord-like feel.

At their origin the crura are entirely fibrous (or ligamentous?) in their structure (Fig. 41).

Vascular Supply.—In studying this we enter upon the subject of the erectile organs of the female,[2] which should first be considered in detail, and then in their relations to one another and to the general circulation. The clitoris is the most important link in the chain that may be said to

[1] Savage, *op. cit.*, p. 6 and pl. i.

[2] Ranney (*op. cit.*, p. 98), after Savage, divides the pelvic structures rather arbitrarily into three classes—the "erectile," "erecto-turgescent," and "turgescent." The former includes the clitoris and its crura; the latter the urethra and vagina; while the body of the uterus and the ovarian and vaginal bulbs belong to the second class. As this idea rests upon physiological rather than upon anatomical facts, we can give only this passing reference to it.

begin at the vaginal bulbs and to end at the ovary. It receives its arterial supply from the two terminal branches of the pudic, which run between the point of junction of the crura and the arch of the pubic bones, pierce the suspensory ligament, and follow along the dorsum of the organ on either side of the vein. One of these vessels supplies the body of the clitoris, corresponding to the artery of the corpus cavernosum in the male; it is called the profunda. The other, larger branch is the analogue of the dorsal artery of the penis, and divides at its termination into twigs which supply the glans and prepuce (dorsal artery).[1] These two arteries have a free intercommunication by means of their small branches. Their peculiar ultimate terminations will be described with the minute anatomy of the part. The blood is returned from the clitoris by the dorsal vein, which begins by the union of efferent branches from the glans, around the end of which is a small plexus, and receives numerous tributaries as it passes backward along the dorsum between the two arteries before mentioned, and reaches the pelvis by ascending to the space between the arch and the subpubic ligament. It terminates in the vesical plexus.[2] The upper ends of the vaginal bulbs are so intimately related to the veins of the clitoris that Hart and Barbour regard the pars intermedia as almost a portion of the organ. "The glans clitoridis," they affirm (p. 4), "is not directly continuous with the body, but joins it *through the pars intermedia of the bulb.*" The writer has never been able to verify this statement.[3] Besides their connection with the pars intermedia, the veins of the clitoris communicate with the urethral, perineal, pelvic, and, indirectly, with the obturator veins, as will be readily understood by a glance at Savage's plates (pl. vi.). The difference between the vascular supply of the penis and clitoris is greater than appears at first sight, that of the latter being both richer and more complex in its relations. The difference may be roughly stated by saying that the penis has a richer *internal*, the clitoris a more extensive *external*, supply.

The clitoris is surrounded by a plexus of lymphatics which receive numerous branches from the deep tissues, the whole terminating in the superficial inguinal glands.

The nerves of the clitoris are unusually numerous, considering its size. "Small as this organ is compared with the penis," says Savage, "it has in proportion four or five times the nervous supply of the latter." Numbers of fibres belonging to the sympathetic system accom-

[1] Kobelt (*op. cit.*) mentions several small unnamed branches which run to the corpora cavernosa.

[2] For an elaborate description of the venous plexuses of this region see Gussenbauer's paper, "Ueber das Gefäss-System der äusseren Weiblichen Genitalien," *Sitzungsb. der Wiss.*, July, 1869.

[3] Savage refers to the pars intermedia as "a double row of veins issuing from a double series of apertures at the under surface of the clitoris."

pany the arteries and enter with them the erectile tissue. The pudic nerve, after giving off muscular branches, terminates in a twig of much larger relative size than the corresponding one in the penis, which accompanies the artery between the layers of the deep perineal fascia, pierces the suspensory ligament, and runs along the dorsum as far as the glans, where it terminates in a network which has been aptly described as "a true nervous sheath." It gives off several branches to the body and prepuce, and one of considerable size to the interior of the organ. There is a free communication between the sympathetic and spinal nerves of the clitoris.

B. *Minute.*—The minute structure of the organ resembles so closely that of the penis that it will be unnecessary to repeat a description with which the reader is doubtless somewhat familiar. The glans has an external covering which is similar to that of the nymphæ as regards the presence of papillæ, covered by layers of stratified epithelium and containing capillary loops and nerve-terminations (end-bulbs). There are present in addition a special variety of end-bulbs known as "the genital corpuscles of Krause," which are also found in the mucous covering of the glans penis. The erectile tissue of both the glans and body does not need a separate description. As before stated, the trabeculæ are more delicate than in the penis, and the tissue is rather a collection of venous plexuses than of cavernous spaces. The opposite halves of the corpus are practically one, since the septum between them offers no barrier to the free intercommunication of the plexuses. If a number of cross-sections of the corpus and crura are examined, the fibrous covering (tunica albuginea) will be seen to increase in thickness from before backward at the expense of the spongy tissue, until the latter dwindles away at the origin of the crura.

Vestibule.[1]

Synonyms.—*Lat.*, vestibulum, atrium vaginæ; *Fr.*, vestibule, canal vulvaire; *Ger.*, Vorhof; *It.* and *Sp.*, vestibulo.

Definition.—The vestibule is a triangular area, the sides of which are formed by the inner edges of the nymphæ, while its base corresponds with the upper margin of the vaginal orifice. Its apex lies immediately below the clitoris.

The vestibule is ordinarily included among the structures forming the vulva, although it is simply a surface covered by mucous membrane, which is of importance only because of the structures contained

[1] As its name implies, the vestibule has been regarded as the entrance to the vagina. Thus Dunglison defines it as "a smooth cavity between the perineum and nymphæ in the female, which leads to two passages—to the urethra above and to the vagina below." French anatomists have termed it the canal vulvaire. It is better to regard it as entirely independent of the vaginal orifice.

within it. Henle applies the name to the labia pudendi and the space between them.

Gross Appearance.—The vestibule is covered by mucous membrane, which presents a corrugated appearance. The color of this membrane is redder and its texture finer than that of the nymphæ. The line of separation between skin (or transitional tissue?) and mucous membrane is not so well defined here as it is at the edge of the vaginal orifice. Several depressions or crypts (glandulæ vestibulares minores) will be observed on the floor of the vestibule: most of these are ranged about the urethral opening, which appears as a small dimple or pucker in the mucous membrane at the middle of the base of the triangle, three-fourths of an inch below the clitoris and about an inch from the fourchette. The meatus will be described with the urinary tract.

The dimensions of the vestibule, as well as the appearance of its mucous membrane, are quite variable, especially in multiparæ. Moreover, the crypts are sometimes of minute size, while they may be one-third as large as the meatus. They vary in number; there are generally five or six.

ANATOMY.—A. *Gross.*—On dissecting off the mucous membrane of the vestibule an intricate venous plexus will be observed, which can only be studied satisfactorily by means of special injections. When fully injected these veins are seen to have a general transverse direction both above and below the urethral orifice; they constitute the pars intermedia, and serve both to unite the opposite vestibular bulbs (hence the name "isthmus") and to establish a free communication between these bodies and the vessels of the corpora cavernosa of the clitoris.

Much confusion has arisen on account of the vague description of the bulbs in most textbooks. A study of the best plates, supplemented by careful dissections of this region, will convince the reader that the bulbs are situated not within, but at the sides of, the vestibular area, that space being occupied only by the connecting plexuses above mentioned. Moreover, the expression "glandulæ vestibulares majores," as applied to the vulvo-vaginal glands, is misleading, since it gives the impression that these structures are related to the vestibule, which is incorrect.

B. *Minute.*—Microscopically, the vestibule presents nothing of special interest: as viewed in a cross-section its superficial covering consists of several layers of pavement epithelium. The mucous glands, the diameters of which vary from 0.5 to 2.5 mm., are of the compound racemose type, consisting of numerous acini which open into branching ducts; these latter terminate in single short ducts which open on the free surface by large orifices. The acini are lined with a single layer of columnar epithelium, which is continued into the ducts as far as their orifices,

where it passes gradually into the pavement variety. Beneath the mucous membrane is a rich network of fine capillaries, which may be traced into papillæ to form loops, in the manner already mentioned. Sebaceous glands are entirely absent. There are no special features about the nerve-supply of this region; it is not so rich as that of the surrounding parts. Beneath the mucous layer is a layer of connective tissue in which is the venous plexus constituting the pars intermedia. The veins are immediately surrounded by a layer of fibro-muscular tissue, so that this region may be included among the turgescent bodies in Savage's classification.

Before describing the vagina it is necessary to refer to two pairs of bodies which are in immediate relation with the vulvo-vaginal orifice, although, as has been stated, they are more commonly described in connection with the vestibule. These are the vaginal bulbs and the vulvo-vaginal glands. These structures are quite dissimilar in their character and functions, since the former are essentially erectile masses belonging to the chain which terminates with the bulbs of the ovaries, while the latter are simply mucous glands of unusual size.

The bulbs of the vagina (bulbi vestibuli vaginæ, bulbs of the vestibule) are two oval masses of veins situated on either side of the base of the vestibule and the upper two-thirds of the vulvo-vaginal outlet. They have been described as "leech-shaped masses of reticulated veins." They are somewhat conical in shape, their bases, which are rounded and measure half an inch in diameter, being opposite the lower third of the ostium, while their apices (not sharply defined) extend as high as the level of the meatus urinarius, where they are prolonged by the pars intermedia as high as the root of the clitoris.[1] Their length is about an inch and a half. It should be stated, in explanation, that this description of the bulbs applies to these bodies when distended by injection. The reader who attempts to dissect them out in their collapsed state will be greatly disappointed at the discrepancy that will exist between his dissections and the classical plate of Kobelt.[2] Hence Hart and Barbour (p. 10) describe them as "small masses of erectile tissue about the size of a *bean*." When distended they fill the spaces between the vestibule and edges of the ostium and the pubic arch. Their relations have already been partly described. They surround the ostium vaginæ, their inner surfaces being just beneath the mucous membrane of the vagina, while posteriorly they are in contact with the anterior layer of the triangular ligament. They

[1] Quain (*Anatomy*, last ed.) makes the doubtful statement that "their upper pointed extremities are attached to the crura of the clitoris."

[2] It is difficult to escape the impression that Kobelt's drawing is exaggerated, since he figures the lower ends of the bulbs as actually on a level with the anterior edge of the perineum. Savage's plate (pl. vi.) corresponds more nearly with the results of most dissections.

are partially covered on their anterior and outer aspects by the bulbo-cavernosi muscles. Behind their lower ends are the vulvo-vaginal glands.

The bulbs, which are regarded as the analogues of the bulb of the urethra in the male, consist anatomically of complicated venous plexuses enclosed in fibrous sheaths. The expression "masses of erectile tissue" [1] frequently applied to them is not strictly correct. Savage is more exact in referring these bodies to the class of erecto-turgescent structures. The chief feature about their gross anatomy is the free communication of their veins with neighboring plexuses. Not only are they intimately connected with each other by the veins of the isthmus, and with the vessels of the clitoris by the pars intermedia, but they communicate freely with the veins of the labia, perineum, and vagina, and even with the plexuses which unite to form the obturator vein, as well as with the epigastric veins. Their arterial supply is derived from branches of the internal pudic. Their nervous twigs are largely derived from the sympathetic system, the nerves accompanying the arteries.

A microscopical section of a bulb will not add much to the information gained by a gross inspection. Externally there is a layer of firm connective tissue, beneath which is a dense mass of veins and tortuous arteries surrounded by fibro-muscular tissue, the histological structure being analogous to that of the erectile tissue of the clitoris, except that the trabeculæ are largely replaced by actual veins.

The vulvo-vaginal glands (glands of Bartholin or Duverney) are small oval bodies, of a reddish-yellow color, varying in size from a bean to an almond, situated on each side of the vaginal orifice near the lower extremities of the bulbs. They lie, as a rule, behind the anterior layer of the triangular ligament [2] (like Cowper's glands in the male, to which they are analogous), and hence behind the rounded ends of the bulbs. They are situated beneath the superficial perineal fascia, in front of the transversus perinei muscles, and between the lower edge of the orificium vaginæ and the erectores clitoridis muscles. The glands vary in size in different subjects: they are largest in young women, while in the aged they become atrophied, and may even disappear. Huguier thought that he succeeded in establishing some relation between the size of a gland and that of the ovary on the same side. During sexual excitement these bodies share in the general turgescence of the vulvo-vaginal region. Each gland has a

[1] Ramsey, *Annals of Anatomy and Surgery*, April, 1883, p. 4.

[2] Ramsey, *N. Y. Medical Journal*, July, 1882; also *Annals of Anatomy and Surgery*, April, 1883. He admits that they may lie either in front of or behind the posterior layer.

duct, from a half to three-quarters of an inch in length, and less than one-fifth of an inch in diameter, which runs along the inner margin of the rounded extremity of the bulb, and opens into the fossa navicularis on the inner surface of the nymphæ, just in front of the base of the hymen.

Microscopically, the vulvo-vaginal glands belong to the compound racemose variety, their acini, secondary, and discharging ducts being lined by columnar epithelium. Their secretion is a yellowish, tenacious mucus, which acts simply as a lubricant to the parts; its expulsion is favored by the reflex contraction of the surrounding perineal muscles.

Practical Deductions.—Bearing in mind the tegumentary character of the external genitals, the reader will naturally infer that they are subject to many of the same affections as the skin in other portions of the body, and that these are to be referred to essentially the same causes. It is hardly necessary to refer to the risk incurred by the physician while practising the vaginal touch in infected females: there is no more dangerous—because unsuspected—source of infection.

The comparative frequency of hypertrophy of the external genitals is readily explained by reference to their structure: thus, an excessive development of adipose may result in enormous enlargement of the mons or labia, so as to interfere with locomotion or sexual intercourse, while hypertrophy of the skin and fibrous tissue may be still more marked, as in elephantiasis. The contractile character of the tissues not only renders healing difficult after extensive loss of substance from wounds, sloughing, the ravages of rodent ulcer, etc., but leads to the formation of large, ugly cicatrices. Hence the danger (aside from that of hemorrhage) which follows the excision of large tumors.

Inflammatory affections of the vulva are seldom confined strictly to this region, but involve the lower end of the vagina, and frequently the urethra, because of the direct continuity of the mucous membrane; conversely, inflammation of the vagina, especially when of a specific character, generally extends to the nymphæ. The extreme pain and hyperæsthesia which attend eruptions and inflammation of these parts, frequently out of proportion to the local trouble, afford a striking clinical proof of their rich nerve-supply, while the reflex symptoms that sometimes result from an insignificant eruption would be inexplicable did we not recall the intimate relation between the cerebro-spinal and sympathetic nerves, which is by no means confined to the internal genitals. Burning and itching sensations about the vulva may thus cause a considerable amount of general disturbance. A familiar illustration of this is offered in the sensitive red patches which are seen on the inner surfaces of the nymphæ in women who have passed the climacteric, especially in connection with urethral caruncle.

The extensive anastomoses of the pudendal veins with the pelvic plexuses, as well as their connection with the erectile system, explain the alarming hemorrhages which occasionally follow wounds of the labia, the excision of cysts and tumors, operations on the perineum, etc. The surgeon need not anticipate any considerable arterial bleeding in this region, although secondary venous oozing is by no means uncommon, especially if one of the vaginal bulbs be wounded. Most of the fatal cases reported resulted from the rupture of dilated veins. This dilatation is best observed during pregnancy, when the labial plexuses are mapped out more clearly than in the most carefully injected anatomical preparations. A rupture of one of these varicose vessels, either by an injury from without or by the pressure of the child's head during parturition, results in the formation of a labial thrombus which may attain a large size. The rapid development of œdema of the external genitals in connection with general venous obstruction and anasarca is another striking evidence both of the vascularity of the parts and of the free communication of the veins with the deeper vessels.

The possibility that a tumor of the labium may be a hydrocele or hernia (even of the ovary) will be evident to the reader who recalls the relation which the part bears to the inguinal canal as the analogue of the scrotum. It is often difficult to apply the ordinary rules of differential diagnosis because of the thickness of the adipose tissue covering the tumor.

It has been stated that the vestibule is entirely concealed by the apposition of the labia majora when the thighs are closely approximated. In order to examine this region, then, it is necessary to separate the knees widely and to hold the labia apart. The inexperienced examiner will be disappointed not only at the small size of the clitoris, but at the indistinctness of the meatus urinarius. The small "tubercle" which is said to form a sure guide to the meatus is quite as often absent as present, while prolapse of the mucous membrane of the canal, polypi, etc. may cause a complete alteration in the usual feel of this region. In passing a catheter by the sense of touch the physician will do well to disregard the rule laid down in most of the textbooks on obstetrics, and, instead of searching the vestibular area for a "guide" to the meatus, to look for it at once in the median line immediately above the vaginal outlet. Introduce the fore finger into the vagina, with the volar surface uppermost, locate the meatus, and pass the catheter along the finger as a guide. In this way we not only avoid entrance into the vagina, but can feel and direct the instrument as it glides along the urethra. It should not be forgotten that the glandulæ vestibulæ minores, which lie one on either side of the urethral opening, may become enlarged, forming culs-de-sac admitting the tip of a catheter.

Although the sensitiveness of the clitoris has undoubtedly been exaggerated, it is desirable to avoid fingering it during a vaginal examination: this may always be accomplished by sweeping the finger over the perineum to reach the vulvar orifice, instead of beginning at the vestibule and passing it downward. The clitoris may become the seat of epithelioma or hypertrophy, so that excision of the organ is indicated: as a smart hemorrhage may follow a wound of the dorsal artery, the galvanic écraseur is usually preferable to the knife.

The surgical anatomy of the vulvo-vaginal glands is not without interest. They may become enlarged from simple cystic dilatation, or as the result of inflammation extending from the vaginal mucosa, which is continuous with the lining membrane of the gland and its duct. Under the latter circumstances the presence of gonorrhœa should be strongly suspected. The danger of severing the duct of the gland in the minor obstetric operation known as "episiotomy" has been exaggerated: the accident could only occur through carelessness or want of skill on the part of the accoucheur. The same remark will apply to the operation of perineorrhaphy.

Having considered the external genitals, we shall next proceed to the description of the vagina, which forms a connecting link between these and the internal generative organs.

Vagina.

Synonyms.—Vulvo-uterine canal; *Gr.*, ἔλυτρον; *Lat.*, vagina, sinus muliebris; *Fr.*, vagin; *Ger.*, Scheide; *It.* and *Sp.*, vagina.

Definition.—The vagina is a musculo-membranous canal of variable dimensions, situated between the bladder and rectum, extending from the uterus to the vulva. It is attached below to the ischio-pubic rami; above, it surrounds the cervix uteri, with which it is continuous.

The direction of the vaginal canal varies in different subjects according to the position (especially the degree of inclination) of the symphysis pubis. Its normal axis, as obtained with the bladder empty, forms with the long axis of the uterus an angle described by some anatomists as a right angle, by others as an obtuse, the degree of obtuseness being determined by the amount of distension of the bladder. When the woman is in the recumbent posture the direction of the vaginal axis is nearly horizontal, while in the lithotomy position it forms an inclined plane extending downward and backward from the vulva. De Sinéty claims that the axis of the vagina is rectilinear, and that it is not correct to represent it by a curved line corresponding with the axis of the pelvis, as is done in most works on obstetrics.

The vagina has been aptly termed "a mucous slit in the pelvic floor," since, when it is not artificially distended, its anterior and posterior

walls are in close contact, and it appears in a mesial section of the pelvis as a line convex anteriorly. On cross-section it is represented by a slit, transverse or crescentic in an infant, but H-shaped in an adult, the longitudinal limbs of the H being convex on their inner aspects, the horizontal limb projecting a little anteriorly. The canal when distended shows a gradual increase in size from the hymen to the uterine junction, so that a plaster cast of a nulliparous vagina bears a certain resemblance to a truncated cone. In multiparæ it is capable of great distension and its shape is extremely variable. The length of the canal varies from seven to eleven centimeters, the average being seven and a half. The posterior wall is from one to two and a half centimeters longer than the anterior. The transverse (and antero-posterior) diameter varies in nulliparæ from three to four centimeters, in multiparæ from six to seven. Before entering upon the anatomy of the vagina it is desirable to glance at the structure which forms its lower boundary.

Hymen.

Synonyms.—Virginal membrane; *Gr.*, ὑμήν; *Lat.*, claustrum virginale, valvula vaginæ, zona castitatis, etc. etc.; *Fr.*, hymen; *Ger.*, Hymen; *It.*, imene; *Sp.*, himen.

Definition.—The hymen is a circular or crescentic fold of connective tissue, covered by mucous membrane, which immediately surrounds the orifice of the vagina and forms the lower extremity of that tube.

The hymen is almost invariably spoken of as "a fold of mucous membrane" which partially closes the orifice. Budin proved conclusively that it is anatomically a folding in of the *entire* vaginal wall.[1] His arguments may be stated briefly as follows: 1. After removing entire the genital organs of an infant, if the vulva is detached and the labia minora are divided transversely the hymen disappears, but it reappears on restoring the parts to their original condition; that is, the vagina is like a glove-finger which has a circular opening at its lower extremity; 2, the ridges and columns of the vagina are continued on to the hymen as far as its free edge; 3, the histology of the hymen, which has been carefully studied by De Sinéty, shows clearly that it is not an independent fold of mucous membrane; 4, in the fœtus there is an interval of several millimeters between the vulvar and vaginal openings. The hymen surrounds the latter at as early a period as the end of the fourth month. As the fœtus develops the vaginal orifice approaches the vulvar, until the hymen finally reaches the inner border of the nymphæ. It is interesting to note the fact that the first trace of this fold in the embryo is represented by minute excrescences on the posterior vaginal wall.[2]

[1] *Progrès méd.*, Aug. 1879, p. 677; also Ledru, *Thèse de Paris*, 1855.

[2] *Am. Journ. Obstet.*, 1878, vol. xii. p. 205.

Gross Appearance.—The hymen ordinarily appears as a crescentic fold situated at the posterior part of the introitus. It lies loosely against the posterior vaginal wall, "like a jib bellied by the wind,"[1] and does not assume the appearance of a tense membrane stretched across the orifice unless the thighs are widely abducted so as to separate the sides of the canal. So little obstruction does this variety of hymen offer to the introduction of a foreign body into the vagina that it frequently persists after repeated acts of coitus. Budin[2] states that in the course of a single year he found this structure intact in no less than seventy-five primiparæ who were examined during labor, so that he goes so far as to say, "Ce n'est pas le mari, mais l'enfant, qui a enlevé à sa mère ce quon considére comme les marques physiques de la virginité." On the other hand, the hymen is by no means constant. Mauriceau and Buffon deny its existence.

Several forms of hymen have been described, the most common being the crescentic; the annular, which forms a complete ring around the vaginal outlet, with a central aperture; the cribriform, which is perforated by several small holes; and the fimbriated type, which has a fringed edge. The imperforate variety is of course pathological.

It is unnecessary to refer to the medico-legal importance of this structure, since it is an accepted fact that neither is its presence an absolute proof of chastity in its possessor, nor, on the other hand, does its rupture imply that sexual intercourse has taken place.[3] Schroeder has made a careful study of the appearance presented by the hymen after rupture. (For a detailed account of these, accompanied by drawings, the reader is referred to his original article.[4]) The important fact to remember in this connection is that the so-called caruncule myrtiformes do *not* represent the remains of the hymen after its rupture. It would seem superfluous to refer to this error were it not still retained in popular textbooks. A superficial examination of the hymen in a married woman who has never borne children will invariably reveal the fact that this structure persists just as truly as in the virgin. The caruncles are irregular, fleshy protuberances skirting the vaginal orifice, and are the remains of the sloughing and cicatrizing processes that result from childbirth. A careful examination of these masses will show that they vary greatly in their size and shape, appearing sometimes as mere tags of tissue, sometimes as distinct polypi, which result from injury to the vaginal wall as well as the hymen. As a consequence of labor the line of demarkation between the vulva and vagina is obliterated, the latter being really "unfolded," to use Budin's expression, so that its

[1] Foster, *op. cit.*

[2] *Des Lésions traumatiques chez la Femme, etc.*, 1878.

[3] Comp. Thomas, *N. Y. Med. Journ.*, 1859, vol. vi. p. 196.

[4] See *Edinburgh Med. Journ.*, 1877–78, vol. xxiii. pp. 906–910, for translation.

lower extremity (the hymen), instead of forming a prominent fold five or six millimeters in width, is flush with the wall of the vulva.

Anatomy.—A. *Gross.*—Although it presents the appearance of a thin membrane when viewed from the front, a cross-section of the hymen has a somewhat triangular outline, the base of the triangle resting upon the vaginal wall, while its apex corresponds with the free edge. As will be seen even with the naked eye, the hymen consists of a double fold of mucous membrane, between which is a delicate layer of connective tissue that is directly continuous with that of the vaginal wall. Numerous blood-vessels may also be traced from the vaginal plexuses into the hymen, in which they ramify as far as its free edge.

B. *Minute.*—The mucous membrane is covered by a layer of pavement epithelium, that on the upper surface of the hymen being continuous with the vaginal epithelium, on its lower surface with that of the vulva. Beneath the epithelial layer is a dense network of fibrous tissue, in which are numerous elastic and a few smooth muscular (?) fibres. Many papillæ extend upward into the epithelial layer. Not only is there a rich capillary plexus in the midst of this tissue, but numerous fine nerve-fibrils will be seen under the microscope, the ultimate terminations of which are not certainly known. All of these structures may be traced from the vaginal wall.[1]

Walls of the Vagina.—There are two, the anterior and the posterior: both have a somewhat triangular shape, the bases of the triangles being uppermost. The former extends from the upper edge of the orificium vaginæ to the cervix, in front of which it expands to form the anterior cul-de-sac. Its length averages five centimeters, the lower three centimeters being intimately united with the urethra and neck of the bladder, forming the urethro-vaginal septum. The anterior cul-de-sac is a shallow pouch in front of the cervix which varies in depth according to the amount of inclination of the uterus. The mucous membrane covering the anterior wall is thrown into numerous folds or projections, which are most marked near the vulva and gradually disappear toward the upper end of the canal. These folds are distinguished as temporary and permanent, the former disappearing when the vagina is distended. The latter consist of series of transverse ridges that extend obliquely upward and outward from a median longitudinal ridge known as the anterior column. The transverse cristæ are themselves composed of still smaller secondary ridges, which are covered with papillæ. The anterior column may begin immediately behind the meatus or at the

[1] Budin's view of the origin of the hymen is not universally accepted. Pozzi *Gaz. méd. de Paris*, Feb. 23, 1884, p. 86) believes that it is an outgrowth from the fœtal sinus urogenitalis, and hence that it is really a part of the vulva. He regards the hymen as the analogue of the bulb of the urethra in the male.

small tubercle below it, and it generally disappears at the upper third of the vagina. It is not infrequently divided into two parts by a median longitudinal groove; the opposite halves may reunite. This column may be situated laterally. The ridges are most prominent in the newborn and in virgins; in the latter they are remarkably firm to the touch. They disappear to some extent after childbirth, especially at the upper part of the canal, but they may persist near its lower end in the form of prominent papillæ.

The posterior vaginal wall extends from the lower edge of the orifice to the cervix, behind which it forms the deep pouch known as the posterior cul-de-sac. Its average length is seven and a half centimeters. The lower four-fifths of this wall is loosely connected with the rectum, forming the recto-vaginal septum. There is a posterior column with transverse ridges extending outward from it, but these are not so prominent as those on the anterior wall.

The roof, or fornix, of the vagina is the upper part of the tube where it surrounds the cervix. Its extent and peculiar dome-like appearance are only seen when the canal is dilated, the anterior and posterior walls being normally in contact with the cervix. The posterior cul-de-sac, or fornix, has at least twice the depth of the anterior, on account of the higher attachment of the vagina behind the cervix. This difference is not appreciated on viewing the vagina and uterus externally, because of the intimate union between the two organs. The lateral fornices are simply the portions of the vaginal roof which lie on either side of the cervix; they have no appreciable depth, and serve to connect the anterior and posterior culs-de-sac. The important relations of the latter will be mentioned subsequently.

It is unnecessary to give more than a passing reference to the changes in the vagina which ensue from senile involution—shortening of the longitudinal and transverse diameters, narrowing of the entire canal, atrophy of the mucous membrane, with obliteration of the rugæ—or to the general hyperplasia which results from pregnancy. It shares in the changes which occur in all of the pelvic organs under the conditions mentioned.

Anatomy.—A. *Gross.*—The wall of the vagina consists of three layers —an external, composed of connective tissue; a middle, of unstriated muscle; and an inner mucous layer. The connective tissue serves to unite the vagina firmly to adjacent organs; in fact, Cruveilhier does not regard it as belonging properly to the wall of the canal. It serves also to support the external plexus of veins. The fibres of the muscular layer do not form distinct strata, but interlace; they have, however, been divided into two sets, those having a general longitudinal direction, and those which are circular or oblique. Authorities differ as to the relative position of the fibres, some stating that the innermost

ones are longitudinal,[1] while Breisky[2] affirms that they are usually circular. He admits that in the anterior columns the former arrangement prevails. Luschka[3] describes a bundle of striated muscular fibres which surrounds the lower end of the vagina and also encircles the urethral orifice (sphincter vaginæ).

The mucous membrane of the vagina varies in thickness from one to one and a half millimeters, and extends from the free edge of the hymen to the cervix uteri, over which it is reflected. Its color is normally rosy red, but it may vary from a light pink to a dark purple or slate color, the latter hue frequently appearing during pregnancy. It is closely united to the subjacent muscular layer, and is disposed in the form of columns and transverse ridges, as before mentioned: a section through one of the columns shows that the mucous membrane is much thicker here than it is in the hollow between the ridges, and that it is also more vascular. Numerous papillæ cover the mucous surface; these increase in size during pregnancy. A small amount of acid mucus is normally present on the walls of the vagina. The secretion is augmented during pregnancy and the menstrual period. The vaginal wall has not the same thickness throughout. At the upper part of the canal it measures from two to three lines, while near the outlet it is from five to six lines thick. This difference is due to the variation in thickness of the muscular layer.

Vascular Supply.—The vagina receives arterial branches from several sources. Besides the vaginal arteries, which spring generally from the anterior divisions of the internal iliacs below the origin of the uterine arteries, and give off several parallel twigs which ramify upon the lateral wall of the tube, branches from the uterine supply its upper end, while the pudendal arteries send branches to its lower extremity. All of these vessels anastomose freely with one another, with those of the opposite side, and with the uterine, vesical, and rectal arteries. Hyrtl figures an azygos branch which has a longitudinal course along the anterior vaginal wall and empties into the circular artery of the cervix.

The vaginal veins are disposed in the form of plexuses that form complete vascular sheaths around the canal, one being external to the muscular layer, while the other lies just beneath the mucous membrane. These communicate freely with the pudendal, vesical, and hemorrhoidal plexuses below, and with the plexuses of the broad ligament above. Some of these communicating networks have received special names. Thus a collection of veins situated on either side of the fornix has been called the utero-vaginal plexus; another in the vesico- or urethro-vaginal septum, the vagino-vesical plexus.[4] All of these veins are without valves.

[1] Henle, Klein, and Frey.

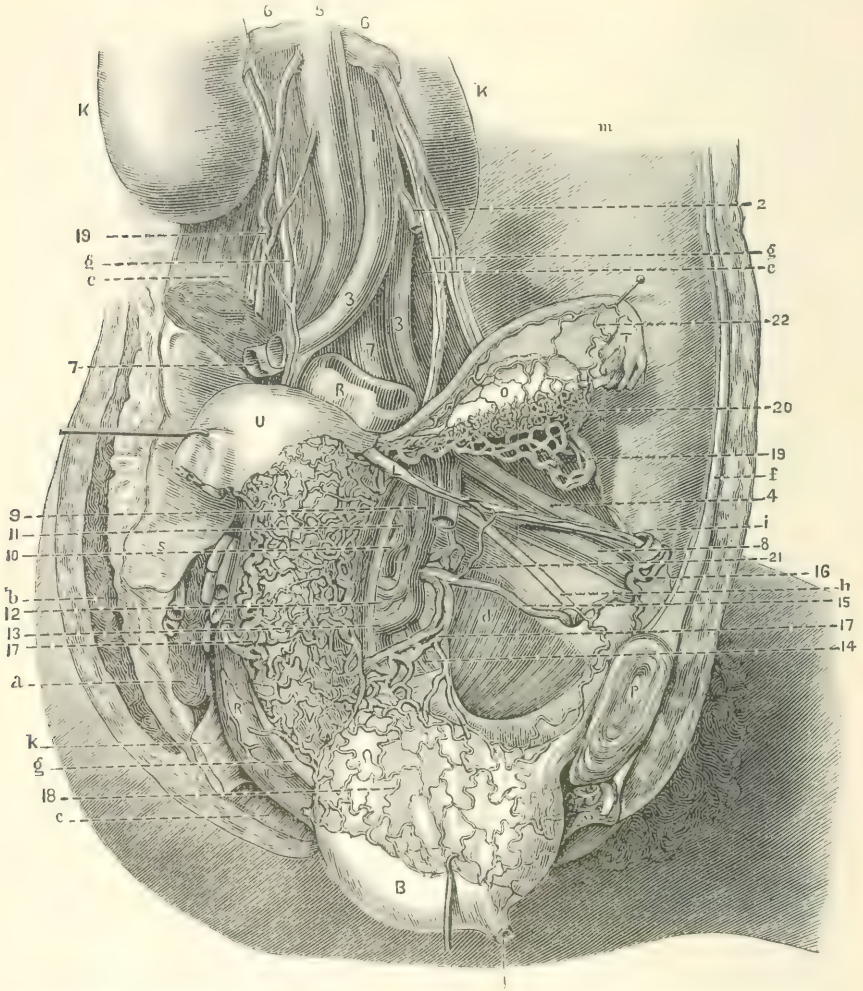
[2] *Krankh. d. Vagina*, 1879, p. 7.

[3] *Op. cit.*, p. 387.

[4] Savage, *op. cit.*, pl. ix. fig. 1.

Lymphatics.—The lymphatics which come from the lower end of the vagina unite with those from the external genitals and enter the inguinal glands. The vessels from the upper three-fourths of the vagina are joined by branches from the cervix uteri and bladder, and termi-

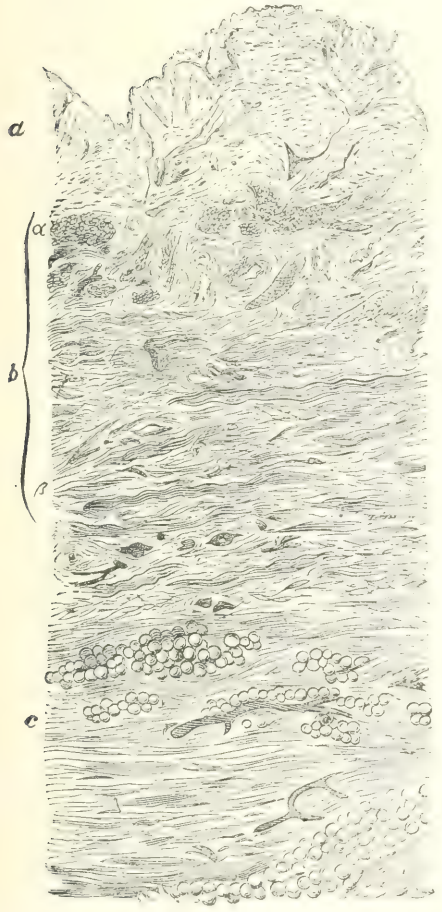
FIG. 42.



Arteries and Veins of Vagina and Uterus (Savage): *B*, bladder cut at urachus and turned forward; *R*, rectum; *L*, round ligament; *U*, uterus; *O*, ovary; *V*, vagina; *S*, sacro-iliac articulation; *K*, kidney; *F*, Fallopian tube; *P*, pubic symphysis; *a*, pyriformis muscle; *b*, gluteal muscles; *c*, ischio-coccygeus muscle; *d*, internal obturator muscle; *e*, *e*, psoas muscle; *f*, linea alba; *g*, *g*, ureters; *h*, obturator nerve; *i*, internal inguinal ring; 1, abdominal aorta; 2, inferior mesenteric artery; 3, 3, common iliac arteries; 4, external iliac artery; 5, vena cava; 6, renal veins; 7, 7, common iliac veins; 8, external iliac vein; 9, internal iliac artery; 10, gluteal; 11, ileo-lumbar; 12, sciatic; 13, pudic; 14, obturator; 15, epigastric veins; 17, uterine veins; 18, vagino-vesical venous rete; 19, spermatic veins; 20, bulb of ovary; 21, vein to round ligament; 22, Fallopian veins.

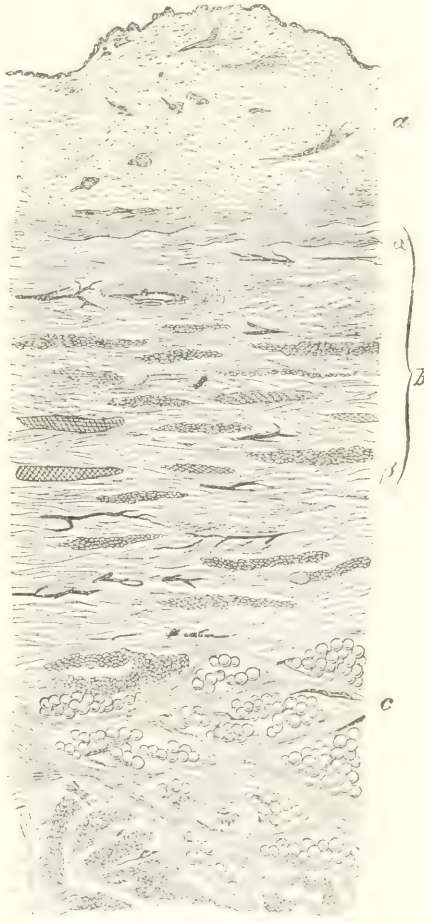
nate in the internal iliac glands.[1] The nervous supply of the vagina is derived almost entirely from the sympathetic system; branches from the inferior hypogastric plexuses form a network around the canal, which is continuous with that which surrounds the uterus.

FIG. 43.



Longitudinal Section of the Vaginal Wall.

FIG. 44.



Transverse Section of the same (Breisky).

a, mucous membrane; *b*, muscular layer, including *α*, circular, and *β*, longitudinal fibres; *c*, fibrous layer, containing fat.

B. *Minute.*—A cross-section through the vaginal wall presents the following appearance under the microscope: There is an external layer of fibrous tissue, in the midst of which will be seen numerous large veins belonging to the so-called plexus venosus vaginalis. Around

[1] According to Le Bec (*Gaz. hébdom.*, April 15, 1881), the united lymphatics of the cervix and upper part of the vagina run beneath the base of the broad ligament, and open into some small glands around the obturator foramen.

these are bundles of smooth muscular fibres, the presence of which suggests a resemblance to true cavernous tissue. Running with the veins are large lymphatics, some of which are dilated so as to form sinuses. More internal to the fibrous layer is the muscular stratum, in which the outer fibres will be divided more or less transversely, while the inner have a longitudinal course. Between and among these are other fibres that cross one another in all directions. Lymphatic plexuses are distributed between the bundles. Internal to the muscular coat is the submucous layer of loose areolar tissue which supports a second venous network, the vessels appearing to be much smaller than those forming the external plexus, and having a general course parallel to the course of the canal. Another set of lymphatics is present in this tissue, the vessels being relatively of large size and having valves. The mucous membrane of the vagina consists of dense fibrous tissue, in the midst of which are numerous elastic fibres, over which are several layers of stratified pavement epithelium. This mucosa with its epithelium is not only thrown into large folds, but forms secondary elevations or papillæ, in each of which is a capillary loop. In sections of the mucous membrane of the fornix these loops are single, but in the large papillæ that cover the rugæ near the introitus there is quite a complicated vascular network. The rugæ have a different structure from the general mucosa, since they contain large venous plexuses surrounded by bundles of muscular fibres, as in cavernous tissue.

The mucous membrane is richly supplied with lymphatics: Löwenstein has described lymph-follicles similar to those in the large intestine.[1]

The existence of true secreting glands in the vaginal mucous membrane has not been postively determined. Von Preuschin[2] has described tubular crypts or glands in the region of the fornix which are lined with columnar (ciliated?) epithelium. Robin, Cadiat, Sappey, De Sinéty, and many others deny the existence of glands in the vagina, and believe that the vaginal mucus is an exudation from the free surface of the mucosa, and not a true secretion.

Nerves ramify throughout the muscular coat and communicate with one another and with the ganglia that are present in considerable numbers. There is a plexus beneath the epithelial layer, the terminal filaments from which enter structures known as end-bulbs.

Relations.—Anteriorly, the vagina is connected with the bas fond and neck of the bladder by means of a quantity of dense areolar tissue. This union, which occurs over the upper half of the vagina, is not as intimate as that between the vagina and urethra, yet the term "vesico-vaginal septum" is applied to the entire thickness of the tissues separating the two cavities. It is formed by the anterior wall of the vagina,

[1] *Centralbl. f. med. Wissenschaft*, 1871, p. 546.

[2] *Virch. Arch.*, Bd. lxx. p. 6.

the posterior wall of the bladder, and the layer of connective tissue between them, in which is the vagino-vesical plexus of veins. The lower half of the anterior vaginal wall is so firmly united to the urethra that the latter is literally "imbedded in it," as Quain describes it, the union resulting in the formation of the "urethro-vaginal septum," which includes the anterior three-fourths of the urethra. The posterior vaginal wall is loosely connected over the middle two-fourths of its extent with the rectum, one or more layers of connective tissue being interposed. The correctness of the term "recto-vaginal septum" as applied to this union has been properly questioned, since the connection is hardly close enough to warrant it. Over its upper fourth the vagina is separated from the rectum by the cul-de-sac of Douglas,[1] while below the level of the pelvic floor the perineal body intervenes between the two canals.

Laterally, the vagina receives the attachment of the pelvic diaphragm —that is, the levatores ani muscles and the fascia covering them—while it is in immediate relation with the large venous plexuses already mentioned.

The relations of the fornix are so important as to deserve a separate description. The anterior cul-de-sac is at least an inch and a half from the vesico-uterine peritoneal fold. Above and well to its outer sides are the ureters, which here bend downward and inward to enter the bladder. The lateral fornices are in relation with the bases of the broad ligaments and the vessels that pass along and below them. The posterior cul-de-sac is covered by the anterior fold of peritoneum which forms the pouch of Douglas,[2] some areolar tissue being interposed, and descends for an inch or more on the posterior vaginal wall. When the bladder is empty a coil of intestine may rest against the peritoneum covering the fornix.

Practical Deductions.—The hymen presents numerous variations as regards shape, thickness, distensibility, etc. The diagnosis of imperforate hymen should not be made too hastily, since there may be a minute opening sufficient to permit the escape of the menstrual blood, yet so small as to be readily overlooked. It is difficult to form a correct idea of the true size of the hymeneal opening in virgins unless the parts are relaxed by an anæsthetic: such patients should be examined under ether, when the finger may be easily introduced through a vulvo-vaginal outlet which before appeared to be hermetically sealed. The presence or absence of the hymen is now regarded as of small medico-legal importance, except in cases of rape, where evidences of recent

[1] The depth of Douglas's pouch is subject to wide variations within normal limits. De Sinéty states that the peritoneum descends on the posterior vaginal wall only to a distance of 12–15 mm. Tillaux assigns 3 cm. as the average depth of the pouch.

[2] According to Hart and Barbour, only one-third of an inch of tissue separates the posterior fornix from the peritoneum.

rupture may be significant. It should not be forgotten that an intact fimbriated hymen may simulate rupture. The caruncuhæ myrtiformes, on the contrary, are of value as pointing to a previous parturition; it is impossible to conceal this sign of childbirth. From its position the hymen shares in inflammatory conditions of the vagina and vulva. When inflamed it is extremely sensitive, as might be inferred from its nerve-supply.

The anatomical relations of the vaginal canal are of extreme importance clinically: it is impossible for the physician to make an intelligent digital examination unless he has them constantly before his mind, while the surgeon will find it necessary to keep his regional anatomy ever fresh. This remark applies particularly to the fornices, which lie in such close proximity to the internal pelvic organs.

The fusion of the urethral and vaginal walls to form the urethro-vaginal septum is interesting surgically. Because of this close union, as well as of the firm connections of the urethra, pure urethrocele, as compared with cystocele, is not common; redundancy of the vaginal tissue is often mistaken for this condition. The thickness of the septum, as well as its vascularity, will be apparent during the performance of the "buttonhole" operation. The looser connection of the bladder with the upper part of the anterior vaginal wall explains the greater range of mobility of the former organ, while the union between the two is sufficiently intimate to render cystocele a common affection. It is important clinically to distinguish prolapsus vaginæ (or descent of the vaginal wall *without* the bladder) from cystocele: the former usually accompanies prolapsus uteri, and, as the reader must infer from his knowledge of the anatomical relations, is a rare condition. In many cases of supposed prolapsus uteri in old women the displacement is really a cystocele vaginalis due to loss of tone of the tissues, which will not be corrected by simply elevating the uterus with tampons or pessaries.

The surgeon finds a convenient access to the base of the bladder through the vagina, cystotomy and lithotomy being simple operations in the female: the hemorrhage is insignificant, and there is no danger of wounding important structures as long as the incision is made vertically and in the median line.

The anterior fornix is a region of far less importance than the posterior. Through it the body of the uterus is distinctly felt when that organ is in a position of physiological anteversion, while the angle in cases of anteflexion is apparent to the least practised touch. Fibroids on the anterior aspect of the uterus, enlargement of the organ from various causes (especially pregnancy), the presence of the fœtal head,—all these objects are accessible through the anterior fornix, especially with the patient in Sims's position. Surgically, we may be called upon

to open the anterior pouch in the operations of supravaginal excision of the cervix and vaginal hysterectomy—a procedure requiring some care, not so much from the danger of prematurely opening the peritoneal cavity and injuring the intestine, as from the liability of entering the bladder. The peritoneum lies high up out of the way, but the bladder is so near to the line of incision that the only safety lies in keeping close to the uterus, while the exact position of the bladder is indicated by introducing a sound into it. The reader who witnesses for the first time this stage of a kolpo-hysterectomy will be surprised at the comparative ease with which the bladder can be separated from its utero-vaginal connections, as well as at the slight amount of bleeding. The peritoneal cavity has been opened through the anterior fornix for the removal of a small subperitoneal fibroid.[1]

The bases of the broad ligaments are directly accessible to the examining finger through the lateral fornices—a point of importance clinically, since it enables the gynecologist to determine the presence of inflammatory processes or their results (adhesions) extending outward from a lacerated or epitheliomatous cervix. The pulsations of the uterine artery can often be felt through the vaginal roof, especially during pregnancy, while it is not difficult to reach and control both vessels by ligature or forceps as a preliminary step in vaginal hysterectomy: on the other hand, the venous oozing may be copious and impossible to check except by continued pressure.

The anatomical importance of the posterior fornix is evident at a glance. It lies in close proximity to the peritoneal cavity. Remember that the depth of Douglas's pouch is variable, and that the peritoneum may rarely dip down between the rectum and vagina so low as to be wounded in operations on the posterior vaginal wall. On the other hand, the lowest point in the pouch may barely reach the level of the fornix. It is hardly necessary to call attention to the various objects which may be touched through the posterior fornix, since this subject belongs to the section on diagnosis. The distinctness with which prolapsed ovaries may sometimes be felt is quite startling to the tyro, so that he almost forgets that they are separated from his finger by a septum composed of several distinct layers of tissue. The beginner should become perfectly familiar with the feel of the sacro-uterine ligaments, so that he will not infer the presence of inflammation in them simply because they happen to be better developed than usual. As to the question of the presence or absence of coils of small intestine in Douglas's pouch, the reader need only observe that if the posterior cul-de-sac be opened through the vaginal roof, the patient being on her back, the proximity of the intestine will frequently be demonstrated in a manner unpleasant to the operator. Practically,

[1] Mann, *Am. Journ. Obstet.*, June, 1885.

then, vaginal hysterectomy is best performed with the woman in the left lateral posture, so that the intestines may gravitate away from the cul-de-sac. The nearness of the gut to the vaginal roof is proved by the occasional occurrence of enterocele. The frequency of suppuration in the subperitoneal space adjacent to the posterior fornix, and the tendency of abscesss to point in this region, are well known. Not only a pelvic abscess, but a peritoneal effusion or an intrapelvic cyst, is easily reached by the aspirator-needle through the vaginal roof. Vaginal ovariotomy or salpingotomy is a tempting operation in many cases, but its difficulties are much greater than they appear: the operator can never be sure that in allowing the stumps to retract into the cavity he has not released some bleeding vessels which cannot be secured. Theoretically, drainage through the vaginal vault should be perfect; practically, it is not, and the danger of sepsis is great. Abscesses and suppurating adherent cysts are not always opened with impunity through the fornix: severe hemorrhage occasionally follows the use of the knife; hence the thermo- or galvano-cautery is preferred by careful operators.

The posterior vaginal wall is more liable to become prolapsed than the anterior, since it is connected with the rectum, as low as the apex of the perineal body, by the recto-vaginal process of the pelvic cellular tissue: that this process is hardly thick enough to constitute a distinct septum will be evident on passing the finger into the rectum.

The attachments of the vaginal tube are important. By reason of its union with the cervix uteri any pressure or traction exerted upon either fornix is transmitted directly to the cervix and indirectly to the body of the uterus. Hence pressure upon the posterior fornix (by tampons or pessaries) tends to draw the cervix backward and to throw the body forward, and, conversely, distension of the anterior fornix by a foreign body will tend to lift the anteverted fundus to a slight extent as the cervix is drawn forward. The practical application of this generally accepted fact is this: A movable uterus (ante- or retroverted) is affected by a pessary or tampon, while with an ante- or reflexed organ the angle of flexion is simply increased by distending either fornix.

It is well to bear in mind the level at which the vaginal roof is attached to the cervix, and the fact that, as the result of contraction following old lesions, the infra- and supravaginal portions of the cervix may be practically continuous. In repairing a laceration of the cervix which has involved the vaginal roof, a careless operator might readily open into the subperitoneal cellular tissue and expose his patient to the chance of septic absorption. When the cervix is atrophied and the laceration has been deep, resulting in the formation of an extensive cicatrix, the accident is not an uncommon one. Fortunately, complications are rare if the sutures are carefully inserted and antiseptic injec-

tions are thoroughly used. In amputation of the cervix (for hypertrophy or epithelioma) it is easy to remove at the same time a portion of the vaginal roof, and thus to open into the subperitoneal or peritoneal cavity—an accident which is fortunately not followed by fatal consequences so often as might be supposed.

The relations of the vagina to the pelvic diaphragm will be considered in another place.

A few of the general features of the canal deserve mention. We have seen that it is normally a slit, not an open tube; it assumes the latter character only when its walls are artificially separated. The phenomena observed on retracting the posterior wall by the finger or a speculum, as well as the influence of posture on the size and direction of the vagina, are familiar to every one through the classical description of Sims. Some idea of the resistance offered by the pubo-coccygeus muscle may be gained by endeavoring to examine a patient with vaginismus before and after an anæsthetic has been administered. The great distensibility of the vagina is seen during parturition; but it should not be forgotten that in distending it encroaches upon both the rectum and urinary tract. In tamponing for uterine hemorrhage, therefore, the tampons should be so arranged that pressure is exerted upon the former rather than upon the latter canal. Advantage is taken of the distensibility of the posterior fornix in the treatment of retroflexion of the uterus with fixation and prolapse of the ovaries. Crude and mechanical as this method is, no better way of gradually stretching (or causing the absorption of?) old adhesions has yet been devised than the application of pressure through the vaginal roof by means of tampons. Doubtless some brilliant results are obtained in this way, but careful observations at the examining-table, as well as experiments in the dead-house, have convinced the writer that it is frequently impossible to dislodge an imprisoned uterus or ovary by pressure exerted from below through the posterior fornix. Whoever devises a safe and scientific method of overcoming this difficulty will deserve a place only a little lower than that of the pioneers of abdominal surgery.

It is surprising how the posterior fornix may be "ballooned out" as the result of long-continued packing: a pouch so shallow that it will not retain a pessary may in this way be deepened to the extent of from one to two inches. A slight amount of reflection will convince the reader that by introducing the plug with the patient in the knee-chest position he will obtain the assistance of gravity, both in replacing the pelvic viscera and in deepening the posterior fornix.

The thinness of the vaginal walls (two or three lines) should not be forgotten during operations for rectocele and cystocele. It is a fact of common observation that in denuding, as soon as the mucous membrane has been removed, the surgeon reaches immediately the large submucous

venous plexus, which it is desirable not to wound. Whether, as Dr. Emmet believes, it is possible to penetrate the entire thickness of the vaginal wall with a needle in posterior colporrhaphy, and to catch up the torn fascia outside, it is impossible to decide, since no dissections have been made for the purpose of proving this statement. In spite of the instructions which are given in descriptions of this operation, it is probable that in most instances it consists essentially in merely taking a reef in the redundant vaginal mucous membrane. The marked tendency of the tissues to stretch proves a source of annoyance to the surgeon, who frequently finds that a few months after the performance of plastic operations, undertaken with the view of narrowing the canal, its calibre is nearly the same as before.

The continuity of the vaginal mucosa with that of the uterus and Fallopian tubes is an anatomical fact of extreme practical importance. Gonorrhœa is a serious affection in the female: the physician who, in the light of our present knowledge of tubal pathology, continues to regard it as an insignificant local inflammation is certainly not abreast of modern ideas. One of the chief reasons why gonorrhœa in the female is such a chronic affection is because there are so many folds in the vagina which are not reached by the local applications and injections.

The normal rugosities of the vagina are sometimes so marked that they may be regarded as pathological: the distribution of the papillæ and follicles is well shown in granular vaginitis, a condition often present during pregnancy. Cysts, resulting from dilatation of the mucous follicles, are not very common: they are usually found near the ostium, and should not be confounded with enlargements of the vulvo-vaginal glands. They may be incised and the lining membrane touched with a caustic, or the cysts may be dissected out entire: in the latter case the caution with regard to the thinness of the vaginal wall will not be unheeded. The same applies to operations for the removal of polypoid tumors, to curetting for primary and secondary epithelioma, etc.

The remarks concerning the nerves and vessels of the external genitals apply also to those of the vagina. The reflex symptoms observed in vaginismus furnish sufficient evidence of the continuity of the pelvic nerve-plexuses. The phenomena may be due to some cause entirely outside of the vagina. There being two sets of valveless veins in the vaginal wall, which communicate freely with the deeper plexuses, any obstruction to the pelvic circulation or general engorgement will at once affect the former. The blueness of the mucous membrane of the vagina during early pregnancy is sufficiently familiar, yet ovarian and uterine tumors or prolapsus may cause the same appearance. During operations on the perineum and posterior wall, when the patient is profoundly etherized the submucous plexuses appear

greatly distended as the mucous membrane is removed. Wounds of the vagina often give rise to profuse venous hemorrhage, especially during pregnancy and parturition.[1] It is better to pass a suture under the bleeding vessel than to endeavor to isolate it or to ligate *en masse*. Hot water is an excellent styptic during plastic operations. On the same principle, copious injections of water at a high temperature (110° F.), the hips being elevated in order to favor the return of the venous blood, frequently cut short an attack of acute vaginitis. Even those who question the antiphlogistic action of hot water in deep intrapelvic inflammation will not doubt its value in cases where it can be applied so directly to the affected spot.

The union of the lymphatics of the lower fourth of the vagina with those of the external genitals has already been mentioned. Le Bec's statement that the lymphatics of the upper three-fourths of the canal unite with those of the cervix and pass below the broad ligaments to the obturator glands, and that they communicate freely with the inguinal glands, seems to be borne out clinically by the fact that the latter are commonly involved in malignant disease of the upper portion of the canal. The hopelessness of effecting a radical cure in such cases is sufficiently evident. The blood- and lymphatic-supply of the cervix and upper part of the vagina being practically the same, it is evident that the prognosis in malignant disease, as regards its extension to surrounding tissues, will be nearly identical for both regions.

Uterus.

Synonyms.—*Eng.*, womb; *Gr.*, ὑστέρα; *Lat.*, matrix; *Fr.*, matrice; *Ger.*, Gebärmutter; *It.*, matrice; *Sp.*, matriz.

Definiton.—The uterus is a hollow, thick-walled organ, shaped like an inverted truncated cone, occupying the middle of the pelvic cavity between the bladder and rectum.

Position.—The normal position of the uterus has long proved a fruitful subject for discussion among both pure anatomists and gynecologists. It will be impossible to rehearse in such a brief paper as this the results of the many investigations that have been made in order to determine a point which at the first glance appears so simple.[2]

Much of the difference of opinion on this subject has arisen from the fact that observers have sought to assign arbitrarily a certain definite position to the uterus, and have not made due allowance for the influences exerted upon it by neighboring organs. It must be evident to

[1] Compare paper by Dr. Mann on "Surgical Operations on the Pelvic Organs of Pregnant Women," *Gynæcological Transactions*, vol. vii.

[2] For the literature of the subject the reader is referred to Hart and Barbour's *Gynæcology*, chap. ii., and to the list of authors appended to Ramsey's *Injuries and Diseases of the Female Pelvic Organs*.

any one who has studied the pelvic organs in the cadaver that no dissections or frozen sections, however carefully they may be made, can ever present a perfect picture of the relation of these organs as they appear in the living subject. The elasticity of the tissues is lost, and the uterus, deprived of its natural supports, which are so nicely balanced during life, must necessarily assume a position far different from that which it once occupied. In short, such results as those obtained by Schultze and Kohlrausch, as proved by their figures,[1] will go far to convince the reader that clinical observations are more likely to give a satisfactory solution of this question than are pure anatomical studies. Still more reliable are those results which are obtained by a judicious combination of both methods. It is sufficient for practical purposes to state that, with the bladder and rectum empty, the uterus is normally in a position of slight anteflexion, the os externum being directed downward and backward, and the entire organ having an inclination toward the right side.[2] To what extent its anterior surface is in contact with the posterior aspect of the bladder (as affirmed by Hart and Barbour) is not clear, nor is it of any practical importance. It is well known that the uterus possesses a considerable range of mobility, its position varying according to the amount of distension of the bladder.[3]

When viewed from above the uterus appears as a pear-shaped body, somewhat flattened from before backward, so that its anterior surface is nearly plane, the posterior being distinctly convex. It tapers gradually to a point near its middle, where there is a slight depression (most marked on the posterior aspect) that represents the line of demarkation between the body and the cervix. This sulcus is not seen when the uterus is observed *in situ* in the living body or when it is injected after its removal. The fundus uteri lies either just below or on a level with the plane of the pelvic brim: the tip of the cervix, according to Savage, "marks nearly the centre of the pelvic cavity—the centre of a general radius of about two inches."

Dimensions.—The entire length of the unimpregnated uterus is about three inches, the cavity of the organ measuring between two and two and a half; a little less than two inches belong to the body. The transverse measurement at the level of the Fallopian tubes varies from one and a half to two inches; that at the constricted portion, or isthmus, from one-half to one inch. The average antero-posterior diameter of the organ is about an inch. The weight of the virgin uterus varies from seven to twelve drachms. The sulcus before alluded to separates

[1] Hart and Barbour's *Gynæcology*, figs. 50, 51.

[2] There is doubtless truth in Luschka's idea, that muscular fibres in the utero-sacral ligaments (called by him the retractores uteri) assist by their contraction in maintaining the uterus in a position of anteversion (*Anatomie der Weiblichen Beckens*, p. 361).

[3] Compare Van de Warker's papers, *N. Y. Med. Journ.*, vol. xxi. p. 337; *Am. Journ. Obstetrics*, vol. xi. p. 314.

the uterus into two portions—the upper, pyriform mass being called the body; the lower, spindle-shaped portion, the cervix. That part of the body which lies above a line joining the proximal ends of the Fallopian tubes is known as the fundus. The cervix has been further subdivided by Schroeder into three segments, the upper and lower of which are called, from their relation to the point of attachment of the fornix vaginæ, the supra- and infravaginal portions, while an intermediate zone of rather indefinite size is assumed as existing between them.

It is sufficient for practical purposes to consider the cervix as consisting of two parts—an upper, which lies above the vaginal vault, and a lower, which is below it. The supravaginal portion of the cervix extends from the isthmus to the roof of the vagina; its transverse diameter is a little less than an inch, its antero-posterior half as great. The relations of this segment of the uterus are important, and will be described later. The infravaginal segment of the cervix is most interesting to the gynecologist, because it is the only part of the uterus which is directly accessible to the eye and finger. Its size and appearance are extremely variable, according to the age and sexual activity of the subject. In the virgin the cervix appears as a small conical projection about one-third of an inch in length, having a smooth, firm feel. Its apex measures seven or eight lines transversely and five in its antero-posterior diameter. At its centre is the external os (os tincæ), a small opening or slit one or two lines in width, situated between the anterior and posterior lips and directed backward. The anterior lip is considerably longer than the posterior, although from the depth of the posterior cul-de-sac and the greater distance of the posterior lip from the ostium the reverse seems to the true.

The cervix in nulliparous married women is usually larger than in virgins; its conical shape is less marked, the os is more open, and the lips have a softer feel. It is a question as to what changes may occur in the cervix within strictly normal limits as the result of parturition. In multiparæ the lips are softened and increased in size, and the os is an irregular opening, around the edges of which are small irregularities and cicatrices, even where no actual laceration has occurred. It should not be forgotten that certain pathological conditions, such as cervical endometritis, may lead to eversion of the lips and an irregular, gaping os—appearances which closely simulate the results of childbearing. In consequence of senile atrophy the lips may become so shortened that they seem to be almost flush with the vault of the vagina.

The body of the uterus includes that portion of the organ which lies above the isthmus. Its form and dimensions have already been referred to. It has two surfaces and three borders. Of the former, the anterior surface is flattened, the posterior convex. The upper border, which is convex, is continuous with the upper surfaces of the Fallopian tubes.

The lateral borders are convex at the upper portions, but become concave at the isthmus. At the superior angles of the uterus (where the lateral pass into the upper border) are the origins of the tubes; just below these are the attachments of the ovarian ligaments, while still lower the round ligaments arise. Besides their relations to these structures, the lateral borders are intimately connected with the broad ligaments, and especially with the vascular plexuses that lie between their folds. The arteries, veins, and lymphatics enter and leave the uterus at these borders. The body of the nulliparous uterus is smaller than that of the multiparous, and is more distinctly flattened antero-posteriorly, while the triangular outline is more apparent.

The uterine cavity is not strictly a cavity at all in the normal organ, since its anterior and posterior walls are in contact. As studied in a coronal section, it consists of two portions, between which is a constriction (the isthmus). The cavity of the body has a triangular shape, the apex of the triangle being at the isthmus, while at each end of the base is the opening of a Fallopian tube. A third opening (os internum) leads from the cavity of the uterus into that of the cervix. The latter is fusiform before childbirth, conical afterward; at its upper end is the os internum, while the os externum forms its lower limit. The length of the entire uterine cavity averages two and a half inches, its width one and a half, the antero-posterior diameter of the corporeal cavity nine-tenths of an inch, while that of the os internum is three-eighths of an inch. The entire capacity of the uterine cavity is two or three cubic centimeters (Sappey). The internal lining of the corporeal cavity is smooth, that of the cervix is corrugated. As in the vagina, there is a longitudinal ridge on both the anterior and posterior walls, from which oblique processes (arbor vitæ uterina) are given off.

ANATOMY.—A. *Gross.*—The uterine wall consists essentially of two layers, the muscular strata and the mucous membrane. The peritoneal covering of the organ, although intimately connected with it, is not really a constituent part of the wall, and will be considered with the peritoneum. The muscular tissue of the uterus is best developed after impregnation, when it may be separated into three fairly distinct layers; hence a minute study of the musculature is more interesting from an obstetrical than from a gynecological point of view. Of the three layers, the external or superficial is most distinct over the anterior and posterior surfaces of the organ, where it is seen as a thin layer (closely adherent to the peritoneum), which sends off prolongations that may be traced between the folds of the broad ligaments (as the ovarian ligaments) and along the round ligaments to their termination in the mons Veneris. Both of these ligaments deserve a separate description.

The former fibres are derived from the posterior surface of the uterus, the latter from that portion of the "platysma" (as it has been appro-

priately named) which covers its anterior surface. The superficial muscular layer of the Fallopian tubes is also derived largely from the latter source. The lateral aspects of the uterus are entirely devoid of this superficial stratum.[1] The middle layer, which is by far the thickest, consists of interlacing fibres, transverse and longitudinal, which are continuous with those of the vagina, having a similar course. Many of the longitudinal fibres, however, cannot be traced beyond the cervix, where they terminate in the connective tissue. This layer constitutes the principal portion of the uterine wall, and is of importance because of the fact that it contains the vessels. These are enclosed within the network of fibres, and may be studied with the naked eye in cross-sections, their intimate relation to the tissue in which they are imbedded being shown by the fact that their walls do not collapse when they are divided transversely.

The thin muscular fasciculi of the internal layer have a general circular direction, which is best marked around the os internum, where they form a so-called "sphincter."[2] This annular arrangement is also seen around the horns of the uterus, where the circular fibres are directly continuous with those of the Fallopian tubes, and in the cervix at the point of attachment of the vagina. Among the muscular bundles in the latter situation are numerous blood-vessels and lymph-spaces, that run transversely. According to Chrobak, the circular fibres enter the mucous layer, so that the union between the two layers is an intimate one.[3]

The connective tissue of the uterus is not distributed in the form of definite layers, but appears as irregular masses of fibres which separate the muscular fasciculi and surround the vessels. It is especially rich in the cervix, as will be inferred from its extensive hypertrophy as the result of pathological conditions (laceration).[4] In the body of the organ a loose areolar tissue is present in considerable quantity in the external muscular layer, where it extends longitudinally, accompanying the bundles of fibres. In the middle layer the individual fibres become finer, while their distribution is circular; they are found almost exclusively around the vessels. The connective tissue of the inner layer is

[1] *Vide* Savage (*op. cit.*, p. 47) for a minute description of the external layer, which, together with its serous covering, he denominates the "sero-muscular platysma." He appears to regard it as derived almost entirely from the prolongations of the longitudinal fibres of the vaginal wall, which simply pass over the surface of the uterus to enter the utero-sacral, round, and broad ligaments and the Fallopian tubes.

[2] Hélie, *Recherches sur la Disposs. des Fib. musc. de l'Utérus*, Paris, 1869.

[3] Savage (*op. cit.*, p. 45) is almost alone in his positive statement that "the uterine walls are absolutely inseparable into layers or coats, and no sort of formula of arrangement of fibre, as in the case of the heart, is conceivable in respect to them." His observations must have been confined entirely to the unimpregnated organ.

[4] Comp. Wylie, "Observations on Laceration of the Cervix Uteri," *Am. Journ. Obstetrics*, vol. xv., No. 1, Jan., 1882, p. 20 (reprint).

Fig. 45.

Section of the Mucous Membrane of the Uterus from near the Fundus (Schäfer): *a*, epithelium of inner surface; *b*, *b'*, uterine glands; *c*, interglandular connective tissue; *d*, muscular tissue.

more abundant than that of the median, although the fibrillæ are so delicate that they are not readily appreciable with the naked eye. There is still some difference of opinion among anatomists as to whether these fibres can be traced directly into the mucous membrane or not. We have not the space in which to enter upon a discussion of this question. The fact that there is such a firm attachment of the mucous and submucous strata to the subjacent parts, aside from careful studies of the normal and pathological histology of the uterus, leads the writer to believe that both the muscular and connective-tissue fibres do penetrate the mucous membrane[1] (Fig. 45).

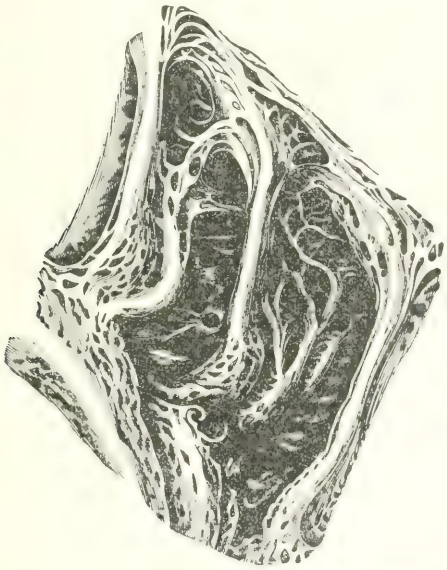
The mucous lining of the uterine cavity varies in thickness from half a line at the fundus (or less in the vicinity of the cornua) to one-eighth or one-quarter of the entire depth of the wall near the centre of the body. It is so intimately united to the muscular tissue, at least in the body of the organ, that the existence of a distinct mucosa has long been denied by many competent observers. In the cervical cavity, on the contrary, where the mucous membrane is much thicker, its attachment to the muscle is not so firm, a layer of areolar tissue intervening.

On account of the marked difference between the mucosa of the body and that of the cervix, it is desirable that they should be considered separately. That of the body is smooth and velvety, of a grayish or grayish-

[1] Quain's *Anat.* (9th ed.), vol. ii., fig. 610, p. 709.

red color, and an average thickness of one-twenty-fifth of an inch. There is a complete absence of folds or corrugations, except in the immediate vicinity of the tubal orifices, where a few small plicæ may sometimes be distinguished, according to Hening. The cervical mucous membrane, as was previously stated, differs from that of the body in being disposed in prominent folds or ridges. It is less distinctly red[1] in color, and is thicker and firmer to the touch. Allusion has been made to the arrangement of the arbor vitæ uterina or plicæ palmatæ. Guyon states that the longitudinal ridges are not exactly opposed, but that the anterior one fits into a depression in the posterior wall of the cervix, so that its canal is practically obliterated. This is best marked near the os internum, where there is a sharp line of separation between the mucosæ of the cervix and body (Fig. 46). The

Fig. 46.



Interior of the Cervix, showing the arborescent appearance of the mucous membrane (Playfair).

arborescent appearance of the cervical lining membrane is best observed in a virgin uterus; after parturition it becomes less distinct.

B. *Minute.*—In a section including the entire thickness of the uterine wall there are presented for study several distinct varieties of tissues. It is well to caution the inexperienced reader that many of the familiar drawings representing the histological structure of the uterus are largely diagrammatic, having been constructed by the comparison of a number of different sections. It is extremely difficult to obtain perfect sections

[1] Yellowish-red, according to most writers.

of the mucous membrane, since this structure is very delicate and soon becomes disorganized. The writer has always placed more confidence in the examination of fresh scrapings from the interior of the uterus than in the specimens obtained from frozen or hardened organs. The peritoneal covering of the organ, like other serous membranes, is most intelligently studied by staining it in the fresh state.

Proceeding from without inward, the following tissues are presented for consideration: (1) A delicate serous layer; (2) a dense mass of fibro-muscular tissue, in which are three different varieties of fibres, blood-vessels, and lymphatics, and finally numerous nerve-filaments; (3) a mucous layer, the structure of which differs in different regions.

(1) The relations of its serous covering to the uterus will be described in the paragraphs on the pelvic peritoneum: it is sufficient to remind the reader that, while this membrane is so intimately united to the muscular tissue over the anterior and upper aspect of the uterus that it can hardly be separated by careful dissection, posteriorly a layer of loose areolar tissue is interposed. When stained with nitrate of silver it presents the ordinary appearance of serous surfaces—*i. e.* a basis of delicate fibrous and elastic tissue supporting large endothelial cells. The capillary and lymphatic plexuses are unusually rich, and may be traced directly into those of the muscular wall; the lymphatic vessels are provided with valves.

(2) The distribution of the muscular substance of the uterus in the form of strata has been described. Under the microscope the longitudinal fibres will be identified by their long fusiform cells arranged in parallel rows. In the centre of each cell is a large oblong nucleus that takes a deeper staining than the surrounding protoplasm. The transverse and oblique fasciculi will be represented by round or oval bodies, cross-sections of the same cells. It is important for the beginner to become perfectly familiar with the appearance of smooth muscular fibres in whatever plane they may be divided, since when stained they are easily mistaken for collections of leucocytes, from the presence of which the incautious observer might infer that some pathological condition was present. It should be remembered that the fibre-cells become hypertrophied during pregnancy, and are a long time in returning to their original size.[1]

Among the separate fusiform cells, and between the different groups, there will be seen, in addition to the usual structureless cementing substance, numerous fine connective-tissue fibres: if the latter tissue is treated when fresh with acetic acid, it will be found to contain a considerable number of elastic fibres. These are recognized, in sections stained with carmine or hæmatoxylin, by their failure to retain the dye.

[1] *Vide* Hélie, *op. cit.*; also Kreitzer, *St. Petersb. Med. Zeitschrift*, 1871, Heft ii. p. 113.

In tracing the fibrous tissue from without inward it will be seen that it gradually becomes finer and more condensed, changing its direction from a longitudinal course in the external muscular layer to a circular one in the inner, where it represents at some points the so-called "submucosa" of mucous membranes. In the median layer the fibres interlace in a complicated manner among the muscular bundles, and also accompany the blood-vessels, which they surround in the form of rings: the latter arrangement can be observed in a cross-section of a medium-sized artery.

The middle muscular layer, as before stated, contains a large part of the vessels of the uterus. The arteries, which are readily recognized by their thick walls and convoluted intima, are especially abundant just beneath the mucous membrane, where they form a capillary network. The veins are unusually large and thin-walled, and are without valves. Their walls are closely adherent to the surrounding vessels, so that the latter remain patulous when divided. These veins, which form dense plexuses in each of the three muscular layers, become dilated in the middle layer of the pregnant uterus to form irregular spaces known as "sinuses."[1] Rouget[2] has described a peculiar mode of communication between the terminations of the arteries and the veins, in which the former are connected with the venous sinuses by means of minute branches, instead of by the usual capillary plexuses.

The lymphatics contained within the muscular substance of the uterus can only be traced by means of special injections. Their extent is best appreciated in pathological preparations, especially in sections of interstitial fibroids that are undergoing the first stage of cyst-formation ("geodes"). In addition to the lymphatic plexus that was mentioned as existing just beneath the serous covering, two varieties of lymphatics may be demonstrated within the muscular substance—a vascular network which accompanies the arteries, and a widespread system of intercommunicating spaces, which not only fill the intermuscular connective tissue, but surround the arteries and veins in the form of perivascular sheaths.[3] According to Leopold, these spaces are lined by a single layer of endothelium. The writer has never been so fortunate as to observe this. The lymphatics of the muscular and serous coats (as well as of those of the mucous membrane, to be mentioned subsequently) may be traced to large vessels in the external muscular layer that empty into the efferent trunks at

[1] Klein (*op. cit.*, p. 268) says that the venous sinuses of the middle stratum represent "a sort of *cavernous tissue*."

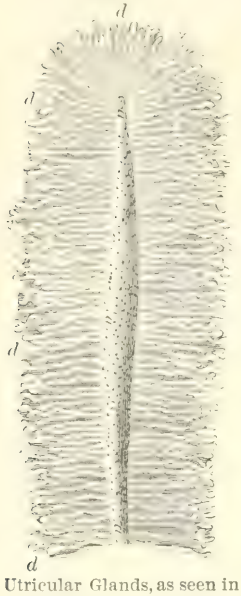
[2] "Recherches sur les Organes erectile de la Femme," *Journ. de la Phys.*, 1858, p. 320.

[3] Comp. Leopold's exhaustive article, "Die Lymphgefässe der normalar nicht Schwangern Uterus," *Arch. f. Gyn.*, Bd. vi. Hft. 1, p. 1.

the lateral borders of the uterus; the latter unite with the lymphatics of the Fallopian tube and ovary and terminate in the lumbar glands.

The minute anatomy of the nerves of the uterus has been most carefully studied by Frankenhäuser. They are derived from the sympathetic system, and their fine filaments may be seen, in fortunate preparations, ramifying among the muscular bundles. According to the above author, they terminate in the nuclei of the fibre-cells.

Fig. 47.



Utricular Glands, as seen in longitudinal section at the period of commencing pregnancy, twice the natural size, showing the arrangement and other peculiarities of the glands, *d*, *d*, *d*, with their orifices, *a*, *a*, *a*, on the internal surface of the organ.

(3) The mucous lining of the body of the uterus is directly continuous with the internal muscular stratum, the usual submucous layer being wanting. It consists of a loose plexus of connective-tissue fibres, among which may be seen groups of fusiform cells that are derived from the subjacent muscular tissue.[1] In the interstices of the fibres are frequently observed collections of leucocytes: in special preparations these spaces are found to be lined with small endothelial cells, each of which contains an oval flattened nucleus.[2] From its histological appearance the mucosa has been compared, not inaptly, to the "stroma of lymphoid organs."[3] Leopold[4] calls it "a lymphatic surface which contains no special lymphatic vessels, but consists of lymph-sinuses covered with endothelium." The free surface of the membrane is covered by a single layer of columnar epithelial cells, which are so easily detached that they are seldom seen *in situ* in sections made from hardened specimens. The presence of cilia on the free surface of these cells, although denied by a few observers,[5] is well established.[6] The writer has found them in fresh scrapings of the uterine cavity, removed by means of the curette, although they were never in motion when seen.

The mucous membrane is filled with glands (glandulæ uterinæ) of the tubular variety, which penetrate through its entire thickness, their

[1] Savage (*Female Pelvic Organs*, Wood's ed., p. 45) says that the tissue composing the framework of the mucous membrane "is permeated by protoplasmic amœboid molecules, which by cell-evolution take the place of effete fixed cells, amongst others the gland-cells, which are dying incessantly in the act of giving out their secretion." This is a very plausible theory, but it is doubtful if it rests upon any positive anatomical basis.

[2] Leopold, quoted by Klein (*op. cit.*, p. 266).

[3] Satterthwaite's *Manual of Histology*, p. 243.

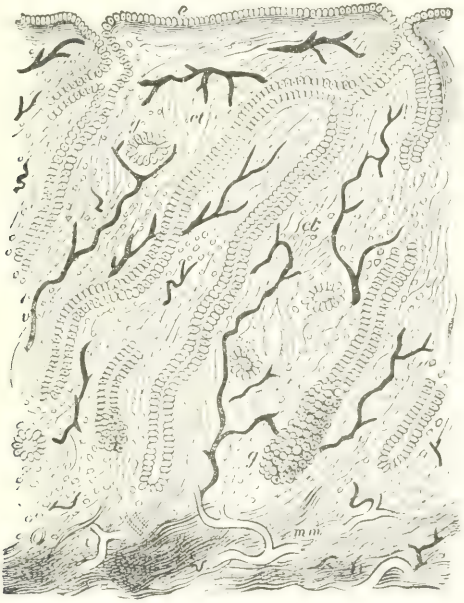
[4] *Op. cit.*, p. 31.

[5] Garrigues, De Sinéty.

[6] Stricker, *Die Lehre der Geweben*, Leipzig, 1871, p. 1173.

culs-de-sac occasionally being imbedded in the inner muscular layer. As Turner has shown, the direction of the glands is not perpendicular to the surface (as Engelmann figures them[1]), but is more or less oblique.[2] They may exist as single tubes, sinuous or spiral, but more often they divide into two or three branches near their lower ends, where they become somewhat dilated. In longitudinal section they present a delicate basement membrane, which, according to Leopold, is "composed of spindle-shaped cells, which dovetail into one another like the endothelium of the capillaries and lymphatics."[3] The existence of this

FIG. 48.



Vertical Section through the Uterine Mucous Membrane (Turner): *e*, columnar epithelium; *g*, *g*, utricular glands; *ct*, connective tissue surrounding glands; *v*, *v*, blood-vessels; *mm*, submucous layer.

membrana propria in the unimpregnated uterus is denied by some authorities; others state that it is only found near the orifice of the gland. It is well marked in the pregnant uterus. Upon this membrane rests a single layer of prismatic cells, with single large nuclei near their bases. It is now generally allowed that these cells are ciliated.[4] The uterine glands increase largely in number at puberty,

[1] *Am. Journ. of Obstetrics*, vol. viii. p. 10.

[2] Ramney, *Annals of Anat. and Surgery*, April, 1883, contra.

[3] Leopold, quoted by Lusk *(op. cit.*, p. 171). See also Ercolani, *Utricular Glands of the Uterus*, trans. by Marey.

[4] Comp. Chrobak in Stricker's *Handbuch*; Nylander (*Müller's Archiv*, 1852, p. 375); Lott (*Rollett's Untersuch.*, Leipzig, 1871; Williams, *Structure of the Mucous Membrane of the Uterus*; Friedländer (*Untersuch. über d. Uterus*, 1870).

being formed by a simple folding-in of the general mucous surface: during menstruation there is a perceptible increase in their length, which becomes much more evident during pregnancy.

The mucous membrane possesses its own vessels and nerves. The glands are surrounded with rich capillary networks, which communicate with the plexuses in the muscular tissue; the lymph-spaces are directly connected with the lymph-sinuses and vessels in the inner layer. The ultimate ending of the nerves in the mucous membrane is not certain. Some of them enter small ganglia; others form plexuses of non-medullated fibres, the primitive fibrils of which are seen immediately below (or within?) the epithelial cells.[1]

The principal differences between the minute anatomy of the cervix and that of the body of the uterus lie in the structure of the mucous membrane. There is no serous investment to the cervix. Its infra-vaginal portion is covered externally by vaginal mucous membrane, the appearance of which under the microscope has already been described. A section through the muscular substance of the cervix shows a preponderance of firm connective tissue as compared with that in the body of the organ. The muscular interlacement is so intricate that a separation into layers is not possible. "In the cervix," says Savage, "the uterus at once loses the characters of an erectile organ"—by which statement he evidently refers to the firmer condition of the cervical tissue and the absence of the large venous sinuses. The blood-vessels of the cervix differ from those of the body in possessing small lumina with extremely thick walls,[2] the thickness being most marked in the circular layer of muscular fibres. Within the tissue of the labia the small arteries and veins run in parallel rows to and from the mucous membrane: this disposition is also apparent in the arbor vitæ, where the vessels run at right angles to the free surface.

The mucous lining to the cervical cavity is considerably thicker than that of the body. In a cross-section it will be noted that there is a layer of connective tissue separating the epithelium from the muscular coat. The parallel rows of vessels just alluded to form capillary plexuses beneath the epithelial layer. The papillæ that have been described by so many writers, and in which the capillaries have been said to form loops,[3] are in reality appearances presented in sections that have been made through the plicæ palmatæ.[4] The latter are due simply to increase in the connective-tissue framework.

The basis of the cervical mucosa is a firm, fibrous, and not a lymphoid, tissue, upon which rests a layer of ciliated cylindrical epithelial

[1] Lindgren, quoted by Klein (*op. cit.*, p. 268).

[2] According to Henle (*Handbuch der Eingeweidelehre*), the diameter of the lumen averages only one-third of that of the entire vessel.

[3] Lusk, quoting from Henle (*op. cit.*, p. 25).

[4] Klein (*op. cit.*, p. 266).

cells. According to some authorities, the cilia are present universally over the upper two-thirds of the cervical canal;[1] the most recent investigations, however (especially those of De Sinéty[2]), have established the fact that ciliated epithelium exists throughout the entire cavity, but only upon the summit of the ridges, the cells covering the depressions being non-ciliated.[3] The glandular structures of the membrane are of the racemose variety, consisting of branching ducts with dilated ends. These are surrounded by capillary plexuses, and consist histologically of simple inversions of the mucous membrane. They are lined by a single layer of non-ciliated[4] cubical epithelium, which is supported by a structureless basement membrane. These glands open upon the free surface by minute apertures that are both upon the ridges of the plicæ and in the depressions between them. They secrete a clear mucus having an alkaline reaction. The well-known ovula Nabothi are pathological appearances due to the occlusion of the follicles and the formation of simple retention-cysts.

In sections of the cervix at the level of the os externum a well-marked line of separation will be observed between the ciliated columnar epithelium of the canal and the vasculæ papillæ and squamous epithelium derived from the reflexion of the vaginal mucous membrane. The latter have been previously described. There has been much discussion as to the presence or absence of glands on the vaginal surface of the normal cervix. It would not be profitable to enlarge upon this topic here. The writer's observations have led him to believe that De Sinéty and Ruge and Veit are correct in denying their existence, except under pathological conditions.[5]

Vessels and Nerves.—The uterine artery is a most important vessel surgically. It arises from the anterior division of the internal iliac, and takes a course downward and inward between the folds of the broad ligament, until it arrives at a point below the level of the os externum, just above the lateral fornix of the vagina. Here it makes a sharp turn upward, and runs along the lateral border of the uterus to unite at about the centre of the organ with the descending branch of the ovarian artery. It gives off numerous horizontal branches, which run in spirals (hence their name, "curling arteries of the uterus") and supply the various segments of the organ, anastomosing with the corresponding branches of the opposite vessel. A branch of considerable size opposite to the os internum unites with its fellow to form a ring

[1] The lower limit is stated by some as within one-sixth of an inch from the os externum.

[2] Also Klein, *op. cit.*, p. 266.

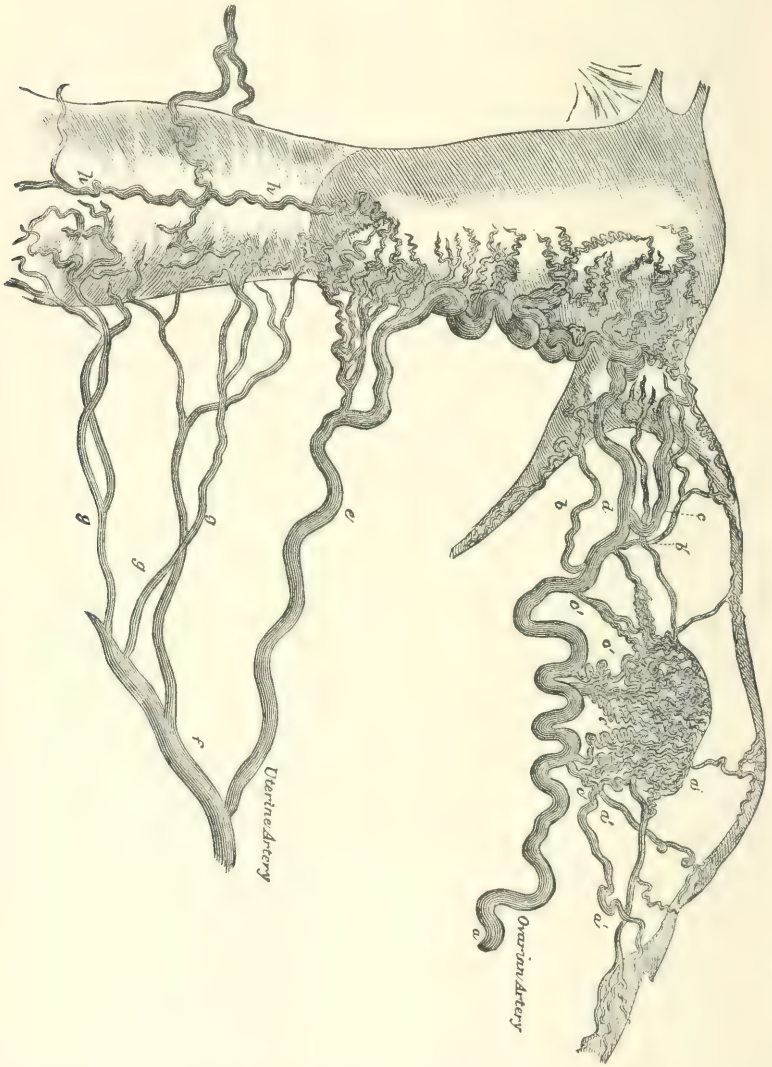
[3] In children, according to Lott (*Zur Anat. u. Phys. der Cervix Uteri*, p. 17), the epithelium in the upper half of the cervix is not ciliated.

[4] The gland-cells are probably ciliated in the newborn, but not after puberty.

[5] See Ruge and Veit, *Zur Pathologie der Vaginalportion*, Stuttgart, 1878.

around the cervix, known as "the circular artery." This vessel is frequently found at a lower level. Other branches run over the fornix vaginæ, anastomosing with offsets of the vaginal artery. The latter

FIG. 49.



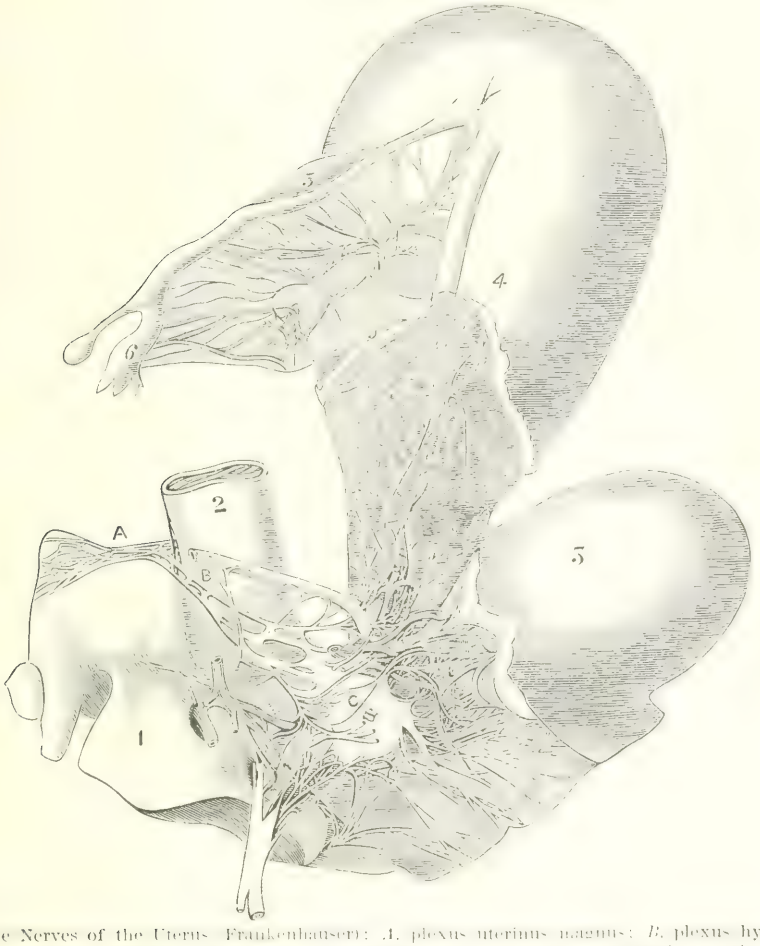
The Ovarian, Uterine, and Vaginal Arteries (Hyrtl): *a*, ovarian artery; *a'* and *b'*, branches to tube; *b*, branch to round ligament; *c*, uterine artery; *c'*, branches to ovary; *g*, vaginal artery; *h*, azygos artery of vagina.

vessel may arise directly from the uterine. Williams has called particular attention to the fact that each horizontal segment of the uterus has to some extent an independent vascular supply, so that flexions of

the organ cannot result in any general obstruction to the blood-flow. The fundus receives additional branches from the ovarian arteries.

The uterus is completely surrounded by intricate venous plexuses

FIG. 50.



The Nerves of the Uterus (Frankenhäuser): *A*, plexus uterinus magnus; *B*, plexus hypogastricus; 1, sacrum; 2, rectum; 3, bladder; 4, uterus; 5, ovary; 6, imbricated extremity of tube.

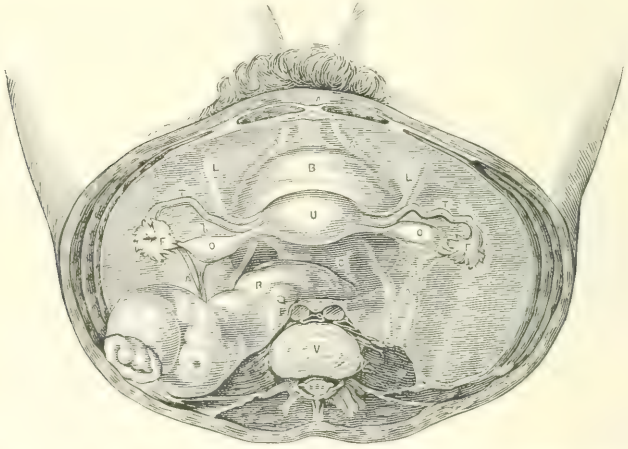
(that lie beneath the peritoneum), which receive the blood from the veins and sinuses within the walls of the organ. These plexuses communicate freely with the vaginal and vesical plexuses below, and with the pampiniform above, and terminate directly in the internal iliac vein, indirectly in the ovarian. The "utero-vaginal" plexus, as figured by Savage, surrounds the lower part of the uterus and the vaginal fornix. The ureters run directly through this mass of veins to reach the bladder.

The lymphatics coming from the body of the uterus unite on each

side with those from the ovary and tube, and form a dense network within the broad ligament around the pampiniform plexus, the efferent branches of which ascend in company with the ovarian artery and terminate in the lumbar glands. The lymphatics from the cervix and upper extremity of the vagina form a plexus at the level of the os internum, and descend on each side to the base of the broad ligament, beneath which they pass to enter the hypogastric glands around the iliac vessels: here they are joined by the vesical lymphatics.[1]

The main nerve-supply of the uterus is derived from the pelvic or inferior hypogastric plexuses, which surround the rectum and send filaments to the uterus and vagina. These are prolongations of the uterine plexus that lies over the bifurcation of the aorta. The uterine branches spring from the sides of the pelvic plexuses, run inward between the folds of the broad ligaments until they reach the cervix, when they turn upward, accompanying the branches of the uterine artery and entering the substance of the organ with them. A large nervous mass, situated between the cervix and rectum, arises from the

FIG. 51.



Transverse Section of the Body, showing relations of fundus uteri (Savage): *M*, pubes; *A*, *A*, hypogastric arteries in front, spermatic vessels and nerves behind; *B*, bladder; *L*, *L*, round ligaments; *U*, fundus uteri; *T*, *T*, Fallopian tubes; *O*, *O*, ovaries; *R*, rectum; *G*, right ureter; *C*, utero-sacral ligaments; *V*, last lumbar vertebra.

union of branches of the upper sacral nerves and ganglia, and a number of sympathetic twigs from the hypogastric plexus: it supplies the cervix chiefly, and is enormously enlarged during pregnancy.

The ultimate termination of the uterine nerves is either in the nuclei of the fibre-cells or in submucous ganglia.[2]

[1] Le Bec ("Contributions à l'Étude des Ligaments larges," *Gaz. hêb.*, Apr. 15, 1881) says that they terminate in the obturator gland.

[2] Frankenhäuser, *Die Nerven der Gebärmutter, etc.*, Jena, 1867.

Relations and Connections.—These have already been mentioned, or will be in the course of the succeeding pages. For convenience they may be briefly repeated. As has been stated, when the bladder and rectum are empty the uterus lies normally in a position of slight anteflexion. At some distance below the fundus uteri, and separated from it by a double fold of peritoneum and a quantity of cellular tissue (below the vesico-uterine pouch), is the fundus of the bladder. The writer cannot accept the statement that the fundus rests upon the bladder, as figured by Schultze, Pirogoff, and others. Behind the uterus is Douglas's pouch, which separates the posterior aspect of the organ from the rectum. When the bladder is empty, coils of small intestine fill the upper part of this pouch and rest against the fundus and posterior aspect of the uterus. Laterally are the broad ligaments, in the upper edges of which are the Fallopian tubes, while below their proximal extremities are the origins of the ovarian and round ligaments. Below is the vault of the vagina, which surrounds and is firmly attached to the uterus. Just above the line of attachment (utero-vaginal) is the portion of the supravaginal segment of the cervix which lies in the subperitoneal space and is surrounded by areolar tissue containing venous plexuses. The relations of the pelvic peritoneum and connective tissue to the uterus will be described under the subdivisions which treat of those subjects. The so-called false and true ligaments of the uterus (except the round ligaments) will be included under the same topics.

Practical Deductions.—Allusion has been made to the range of mobility of the uterus in an antero-posterior plane. It is important that the physician should learn to recognize not only the physiological changes of position produced by a full rectum or bladder, but those caused by posture. For example, if an old multipara is examined upon the back, the uterus, by reason of the weight of the organ and the relaxation of its ligaments, may be felt through the posterior fornix; with the patient semi-prone the uterus falls forward, and the fundus is distinctly touched through the anterior fornix. Two different examiners may thus diagnosticate ante- and retroversion in the same patient.

The normal uterus may be elevated on the finger to the extent of between one and two inches without doing injury to the surrounding parts.[1] The reader should be cautioned against accepting unhesitatingly the statement that "artificial prolapsus" is an entirely harmless procedure. Experiments made upon the cadaver are not conclusive; the inexperienced will act wisely in distrusting the teaching that the uterus

[1] A clear idea of the mobility of the uterus in a vertical direction can be gained by observing during an examination with the speculum the manner in which the respiratory movements are transmitted to the organ. This is still more marked in singing, defecation, etc.

" can be drawn downward by the volsella to the ostium vaginæ without endangering its return to its proper position in the pelvis " (Ranney). Practical gynecologists are apt to be cautious in resorting to such aids to diagnosis. As our knowledge of the frequency of tubal disease and localized peritonitis becomes more certain, we hesitate about exerting much traction upon the appendages by dragging down the uterus in the manner described. It is necessary to be on one's guard during operations or examinations under ether, because when the parts are thoroughly relaxed by an anæsthetic a uterus which previously possessed a limited range of mobility can be pushed upward or depressed to an extent which did not seem possible. Not having the patient's expressions of pain as an index, we may easily rupture recent peritonitic adhesions and do incalculable harm without being aware of it. The cardinal principle in gynecology should be not to do the woman any harm: the question of actually benefiting her is often of secondary importance. The reader will avoid one, by no means imaginary, source of danger if he learns to make a diagnosis and to practise the ordinary operations while displacing the uterus just as little as possible, either with or without instruments.

While we become familiar with the normal mobility of the uterus, we should be equally prompt to recognize impairment of the same, either partial or complete: moreover, if this information can be gained without the use of the sound, so much the better. The diagnosis of retroflexion with fixation will be discussed elsewhere.

Ascension of the uterus—a normal condition in pregnancy—should be viewed with suspicion when the organ is not thus enlarged, since it points to the probable presence of adhesions or morbid growths. Note that it does not follow that the organ is thus displaced because the examiner finds it difficult to reach the cervix: the vagina may be unusually long, or the cervix short. By examining the patient upon the side the mechanical difficulty may be overcome. The extent to which the uterus can be elevated is best appreciated during the performance of Alexander's operation: the limit is found to depend not upon the mobility of the organ, but upon the length of cord which can be drawn through the inguinal ring. The operator can hardly raise the uterus too high.

As the uterus is capable of motion laterally as well as antero-posteriorly, so it may be fixed in a position of lateroflexion by cicatrices in either broad ligament—a displacement which it is particularly difficult to correct by means of tampons.

Lateral deviation of the multiparous uterus is frequently observed when the patient is in Sims's position; the normal mobility in this direction is limited, but distinct. Lateroflexion, with fixation, it is hardly necessary to add, is a more serious displacement, pointing to a

former inflammation in one of the broad ligaments in which the corresponding ovary and tube are doubtless involved; it should lead the surgeon to be on his guard against any rough manipulations.

The changes in position consequent upon the increasing size of the organ (pregnancy, subinvolution) are self-evident: the tendency to prolapsus observed in old subjects is often explained by general atrophy and loss of tone in its supports, the organ itself being really of small size. It is only necessary to allude to the physiological changes in the shape and size of the uterus. It is not always an easy matter to recognize these by bimanual palpation or to assign them to their proper cause. The diagnosis of early pregnancy from the shape and consistence of the organ, as suggested by Hegar, deserves the careful consideration of every gynecologist. He relies upon the presence of softening and thinning of the inferior segment of the uterus, as well as the pyramidal shape assumed by the body.[1] There is a peculiar bulging of the anterior wall and an elasticity of the fundus, as felt through the anterior fornix, which may be recognized as early as the fifth or sixth week of pregnancy, even when the cervix does not show any marked changes.

The anatomy of the cervix uteri and its surroundings should be carefully studied by the gynecologist. He who forms his conception of its appearance entirely from descriptions of the nulliparous cervix will be sadly puzzled when he comes to touch, or to observe through the speculum, the results of an extensive laceration. It is necessary for one to examine a large number of multiparæ before he can be in a position to appreciate the fact that no two cervices are alike. To the various changes in shape, size, etc. to which this portion of the uterus is subject as the result of pathological conditions (especially laceration) we need not refer, since these are touched upon elsewhere; the effect of pregnancy upon the size and consistence of the part is described in works on obstetrics. It was stated that Schroeder's division of the cervix into three distinct zones is more or less artificial; the "portio intermedia" is often wanting in multiparæ. In old subjects the cervix is represented by a small nodule projecting from the vaginal roof. In cases of extensive bilateral laceration with eversion it appears to be flush with the roof, until the opposite lips are approximated, according to Emmet's direction, by means of tenacula.

The long axis of the uterus forms such an angle with that of the vagina that the reader must not be surprised at times to find the cervix high up against the posterior fornix, with the os externum resting against the rectum: this position is of course modified as the rectum and bladder become distended. When the vagina is unusually deep and the cervix long, it may be impossible for a tyro to either touch the os or to bring it into view with the speculum. By applying the prin-

[1] Comp. *Prager Med. Wochenschrift*, No. 26, 1884; *Annales de Gynécologie*, Sept., 1884.

ciple already stated, he will succeed in exposing it by slipping the longest blade of the instrument behind the cervix and gently prying the latter forward, while with the depressor he exerts traction upon it by making pressure in the anterior fornix. The introduction of a retroversion pessary may be rendered difficult by the same condition of the parts. In inserting such an instrument the upper bar has a tendency to slip in front of the cervix and to glide into the anterior cul-de-sac: when this occurs the beginner should remove the pessary and repeat the manœuvre, instead of trying to carry the bar backward over the cervix into position. The same rule should be followed as in introducing the speculum—*i. e.* to hug the rectal wall closely until the tip of the cervix is passed.

A few brief practical points may be mentioned in connection with operations on the cervix, suggested by its structure and relations. The height of the vaginal attachment varies; the posterior wall of the vagina meets the cervix at a point above the junction of the anterior. It is evident that a laceration of the cervix through the vaginal junction must be an extensive one, and liable to be followed by parametritis and subsequent cicatrization. Amputation of an hypertrophied cervix may be compared with circumcision; if the uterus is drawn down and due provision is not made for the retraction of the vaginal tissue, nearly the entire fornix may be excised, leaving an unsightly wound. In high amputation for cancer, if firm traction is made on the uterus while the vaginal attachment is separated, the os internum will be opposite to the line of incision, so that it will only be necessary to divide the cervix straight across. If the disease has invaded the body of the organ, it is easy to remove a wedge-shaped piece; when the parts are allowed to retract, the operator is frequently surprised at the depth of the excavation.

The intimate relation of the cervix to the broad ligaments, with their labyrinth of blood-vessels and lymphatics, renders it easy for us to understand the reason why lacerations may be followed by inflammatory processes. The frequency of so-called cellulitis has been questioned, but the occurrence of inflammation in the tissues adjacent to a lacerated cervix as the result of septic absorption (whether we term it lymphangitis, periphlebitis, or cellulitis) can certainly not be denied *in toto*.[1] At the same time, the direct continuity of the cervical and corporeal endometrium points to a certain source of tubal and peritoneal trouble originating in lesions of the cervix. In all of the autopsies performed by the writer in fatal cases of hystero-trachelorrhaphy and posterior section (five or six) death was due to an extension of inflammation from the wound *upward* along the mucous membrane, *not out-*

[1] Comp. paper by the writer in *Trans. of Alumni Association of the Woman's Hospital*, vol. i. p. 67.

ward along the broad ligaments. Recalling the anatomy of the utero-sacral ligaments, it is not always easy to understand how parametritis posterior can be a frequent accompaniment of cervical lesions.

That incision of the cervix for stenosis is not an entirely harmless procedure is evident anatomically as well as clinically. The proximity of the peritoneum and the rich network of veins which lie in the muscular coat of the uterus render the danger of peritonitis and septic absorption no imaginary one. The indications are clearly to make the incision as limited in length and depth as possible, and to practise rigid antisepsis.

The corpus uteri is only indirectly accessible through the medium of the bimanual touch; in fat subjects it is frequently impossible to feel it at all. Extreme deviations from its normal size and position are easily recognized by the most inexperienced, but to detect moderate enlargements, small fibroids in the anterior or posterior wall, unusual softness of the muscular tissue, etc., requires long practice and a thorough familiarity with the feel of the normal organ. It is a matter of daily experience among laparotomists to find on opening the abdomen that the size and position of the uterus do not correspond to the impressions derived at the examining-table. The fundus, as touched through the fornix, usually appears larger than it really is, the normal protrusion of the anterior surface being often mistaken for an interstitial fibroid. Some gynecologists diagnosticate anteflexion whenever they feel the fundus uteri through the anterior fornix, while others rarely make this diagnosis. If the reader will bear in mind the range of mobility of the organ, he will doubtless meet with fewer displacements. As regards the difference between anteversion and anteflexion, the reader should remember that there is normally a distinct, though large, angle between the cervix and the body, which is increased when the uterus is enlarged and of softer consistence than usual.

It does not belong to this place to enter at length into a consideration of the variations in the shape and size of the corpus uteri. The possibility of an enlargement being due to pregnancy should always be kept in view, even when there are no symptoms pointing to that condition, especially when an operation is meditated. In the absence of this condition, it will remain to determine whether the enlargement is general, and is caused either by some growth in the intra-uterine cavity or by a hypertrophy of the muscular substance, or is of an irregular character, due to growths on its exterior. The normal changes in old age—atrophy, decrease in depth, etc.—must not be mistaken for disease.

Variations in the consistency of the uterine wall are not easily recognized unless marked. The normal fundus has a firm, elastic feel as touched through the fornix; it is claimed that the peculiar softness of the pregnant organ can be recognized as early as the sixth week. In

subinvolution, in malignant disease of the body, etc., the tissue is softened. The recognition of this condition of the muscle should lead the surgeon to be cautious in using the sound, sharp curette, spoon-saw, and other similar instruments, since he might easily perforate the uterine wall.

There are many points in regard to the anatomy of the uterus, both gross and microscopic, which are of direct surgical interest. The depth of the cavity in the unimpregnated organ is usually given as two and a half inches, but it frequently exceeds this measurement in the living female by reason of the elasticity of the wall. Most of the cases in which a probe is supposed to enter one of the Fallopian tubes, because it can be introduced to the depth of four or five inches, should be viewed with suspicion. The cavity in such instances is doubtless really elongated; sometimes the wall itself is perforated without serious consequences, as in a case observed by the writer. It is important for the physician to become thoroughly familiar with the depth, direction, and size of the normal cavity as indicated by the probe or sound, as well as with the peculiar spongy, elastic sensation communicated through the instrument as it touches the fundal mucous membrane, before he can expect to recognize deviations from the normal at the examining-table or undertake manipulations within the cavity. These are matters not of *description*, but of *practice*. Beginners invariably forget that the uterine canal forms a decided curve, and that any instrument designed to enter it must either have a corresponding curve, or in introducing it its handle must be carried well backward to a line parallel with the uterine axis; this applies particularly to tents. A glance at a median section of the pelvis will show that to endeavor to push a tent straight upward in the axis of the os externum is to lose sight of the first principles of common sense, still more those of anatomy; in fact, the writer has known of the posterior uterine wall being perforated in this way. The cavity of the nulliparous uterus appears in a vertical section as little more than a slit; even in the interior of the multiparous organ that has undergone subinvolution there is scanty room for manipulation with instruments. Consequently, in using the curette we are limited mainly to a scraping motion in a vertical direction. Considering the large arc described with the handle of a sharp curette or spoon-saw, as compared with the small space in which the blade revolves, it is evident that some care must be exercised in sweeping the latter about in a circular direction.

The normal constriction at the os internum is often mistaken for a pathological condition. The existence of an angle at this point is to be remembered in introducing the sound, which is often arrested at this point when it is not properly curved; a temporary constriction is frequently caused by a contraction of the sphincter muscle. An internal

os which barely admits of the passage of a probe will easily allow the introduction of a large sound when the patient is anæsthetized. Another practical hint derived from the angle between the cervix and body is this: If an instrument or tent is arrested at the os internum, draw the cervix downward and backward with a tenaculum, thus rendering the canal more nearly straight.

Our opportunities for studying the normal lining membrane of the uterus are few, endoscopy not having achieved many satisfactory results in this direction. In cases of deep laceration of the cervix with marked eversion the mucous membrane is visible nearly as high up as the os internum, but its angry, florid appearance is far from being that of health. It is a mistake to suppose that the lining of the corporeal cavity has normally a soft, spongy feel; it is rather elastic. The rugæ in the cervical canal often render the introduction of a probe difficult when a sound will not be arrested. The normal endometrium being poorly supplied with sentient nerves, no pain should be experienced in the passage of an instrument. Extreme sensitiveness is proof positive of the existence of disease. The uterine wall is of considerable interest surgically. In the non-parous organ, when removed from the body, it appears to be semi-cartilaginous and almost non-vascular, yet few structures bleed more obstinately when wounded. From the thickness of the wall, as seen in mesial section, as well as from its inherent toughness, it would seem as if a blunt instrument could not be forced through it except by the exercise of great violence; but when it is softened by pregnancy or disease (subinvolution, carcinoma) the accident might easily occur.

Divulsion of the cervix—a procedure which is frequently practised at the present day to the exclusion of the cutting operation—owes its success to the complete stretching, or even tearing, of the fibres of the sphincter muscle. Unless this is thoroughly effected, the benefit will only be temporary. In incision of the cervix the surgeon aims rather at straightening, than at enlarging, the canal. The idea that a flexion can be permanently eliminated by the use of an intra-uterine stem is hardly founded on anatomical principles.

Some idea of the extreme vascularity of the wall will be gained during operations which involve direct injury to it, as in the enucleation of interstitial fibroids, myomotomy by Schroeder's method, etc.; fortunately, the contractility of the muscular substance is sufficient to overcome to some extent the tendency to bleeding. Hemorrhage from the external muscular layer is difficult to control; the peritoneal covering of the uterus is sometimes torn while separating adherent ovarian tumors, when the venous oozing is almost uncontrollable. Styptics, the actual cautery, etc. are often useless, and it is impossible to surround the bleeding points with ligatures. During an ovariotomy the writer was obliged

to seize the bleeding surfaces *en masse* with two pairs of long forceps, and to leave these in the abdomen for forty-eight hours. In the intraperitoneal method of treating the stump after hysterectomy it is important to secure all of the vessels on its surface, otherwise a dangerous oozing may occur beneath the peritoneal flaps.

Although the peritoneal covering of the uterus is no longer regarded as inviolable, and subserous fibroids are now removed with impunity, it should not be forgotten that this covering belongs to the general peritoneal lining of the pelvis, in which inflammation extends rapidly. The close proximity of coils of small intestine to the uterus favors the formation of adhesions between their serous surfaces in peritonitis. If the patient recovers with permanent adhesions, she will be subject to distressing symptoms referable both to the uterus and the imprisoned gut. Doubtless this complication would be less frequent if the bowels were moved earlier in the course of the disease, instead of being paralyzed with opium.

The minute anatomy of the uterus does not concern the surgeon so much as it does the pathologist. A study of its vast network of veins and lymphatics, and their connection with the mucous membrane, cannot fail to suggest some practical lessons in regard to the strict use of antiseptics in all operations within the cavity. Although this article does not deal with obstetrics, the writer cannot avoid the temptation to reiterate the trite maxim that an intelligent appreciation of the absorbent power of the uterine vessels would lead accoucheurs to view with apprehension the smallest puerperal lesion, and by their careful use of antiseptics to render subsequent attention on the part of the gynecologist unnecessary. The normal histology of the cervix possesses no small degree of practical interest. Attention has been called to the transition from the columnar epithelium lining the cervical canal to the squamous variety that covers the portio vaginalis beyond the os externum. The importance of this distinction becomes evident in studying the pathology of cervical ectropium resulting from laceration. This subject is discussed elsewhere. We can only emphasize here the fact that "ulceration" of the cervix does not exist—that the raw everted surface seen in these cases is really "*a newly-formed glandular secreting surface* resembling in structure the cervical mucous membrane."[1] The importance of the cervical glands in this connection, as well as in relation to the development of epithelioma, cannot be over-estimated. The cervix during pregnancy has been called by Fritsch a "glandular organ," and the pathological hypertrophy of the glands both explains the causation of cervical catarrh and furnishes a hint for its successful treatment. The glands, being the seat of the disease, must be thoroughly destroyed by means of strong caustics, thorough scraping with

[1] Hart and Barbour, *op. cit.*, p. 279.

the sharp curette, or even by complete excision of the mucous membrane according to Schroeder's method.

The cervix is composed essentially of connective tissue, which is normally tough and resistant; in old age it may assume a semi-cartilaginous consistence. It is anatomically and clinically one of the least sensitive portions of the genital tract; operations have frequently been performed upon it without the use of an anæsthetic, the patient experiencing comparatively little pain. For this reason it is difficult to estimate to what extent cocaine acts as a local anæsthetic in hystero-trachelorrhaphy.

This portion of the uterus is not particularly rich in nerve-filaments, nor does it abound in those terminal bulbs that are found in the external genitals. The explanation of various reflex neuroses in cases of lacerated cervix by reference to the inclusion of nerve-filaments within the "cicatricial plug" at the angle of the tear does not, therefore, rest on a positive anatomical basis.

There is no time to study the anatomy of the uterus with reference to the origin of morbid growths from its tissues. This opens up an interesting subject which has been fully treated by Gusserow.[1]

Some familiarity with the distribution of the uterine vessels is indispensable for one who aspires to a scientific knowledge of gynecology. Probably not one medical student out of twenty ever takes the trouble to inject and dissect them out in the cadaver; fortunately, a study of plates and museum-specimens will enable him to supply his deficient practical knowledge to some extent. Writers on pelvic pathology have unfortunately shown a disposition to distort anatomical facts to suit their individual theories. If the reader will glance at any plate showing the pelvic circulation (Hyrtl's, for example), he will recognize the justness of Dr. Williams's criticism of the theory that uterine "engorgement" is a necessary result of displacements, especially flexions. The uterine artery gives off a large number of parallel branches which run at right angles to the main trunk, and anastomose freely with the corresponding branches on the opposite side, so that the uterus may be regarded as composed of numerous segments, each of which has its independent vascular supply. It is obvious, without argument, that no flexion, however sharp, can cause any considerable interruption of the circulation either above or below the point of flexion. The same principle may be extended to supposed obstructions in the periuterine tissues from localized inflammatory foci (peri- or parametritis); the pelvic vessels anastomose too freely to admit of an unquestioned acceptance of the theory of general obstruction and engorgement.

The uterine vessels are of importance principally from a surgical

[1] *Neubildungen des Uterus.*

standpoint. In vaginal extirpation of the uterus it is important to control the vessels in the broad ligaments before separating the uterine attachments. Some difficulty may be experienced in passing a ligature around the ovarian artery from below. A recent writer has suggested that the operation might be shortened by compressing each broad ligament, with its contained vessels, with a pair of long forceps, detaching the uterus, and afterward securing the vessels at leisure. There is some danger in this method that one or more of them may slip, when it will be a difficult matter to pick them up again. The defect in the plan of starving a malignant growth of the uterus by cutting off a portion of the blood-supply of the organ, or of preventing the hemorrhage in subperitoneal myomotomy by ligating one or two of the arteries, will be evident from what has already been said of the free anastomosis of the pelvic vessels. It should be noted that the uterine artery runs near the base of the broad ligament, so that its pulsation can often be felt through the lateral fornix. Some of its large vaginal branches may be divided in the incision for gastro-elytrotomy. The circular artery of the cervix, formed by the union of opposite branches from the main trunks, is a bugbear that is constantly held up before the inexperienced operator. The fact is, this vessel, which lies opposite to the cervix, is rarely divided in Emmet's operation, and when it is the hemorrhage can be readily controlled by passing a wire suture beneath it and twisting the same. In cases of extensive laceration in which the denudation is carried deep into the angles a small arterial branch is often cut, but the hemorrhage is by no means as alarming as we have been taught to expect.

It should be noted that in certain morbid conditions of the uterus (especially fibro-cystic disease) the vessels are enormously enlarged, so that a venous hemorrhage would be fatal in a short time.

Our knowledge of the functional nervous affections of the pelvic organs is as fragmentary as the study of their nerve-distribution is difficult. Pain as a subjective symptom of pelvic disease is seldom localized in any single organ: the relation between the plexuses is too intimate to admit of the application to them of Hilton's ingenious theories. Doubtless, many supposed ovarian pains are really due to disease of the uterus, and *vice versâ*. When we advance a step farther and consider the relation of the uterine nerves to those of the general sympathetic system, and the various reflex disturbances which result from this intercommunication, we begin to deal with psychical phenomena which have little to do with the sober facts of pelvic anatomy.

We cannot conclude these rambling remarks on uterine surgery more fitly than by quoting from a writer of the old school, whose caution is too often disregarded by the modern gynecologist: "No surgical proceeding whatever, touching any part of the uterine system, should be

unattended by the precautions observed in operations of a grave character there or elsewhere: in certain states of the general system, unforeshadowed by any recognizable peculiarity, the most trivial operation has been speedily followed by fatal peritonitis."[1]

The round ligaments are properly described in connection with the uterus, since they are really outgrowths from the superficial muscular layer.

Round Ligaments.

Synonyms.—Suspensory ligaments; *Lat.*, ligamenta rotunda, ligamenta tereta uteri; *Fr.*, ligaments ronds de la matrice; *Ger.*, runde Mutterbänder; *It.*, legamenti rotonde; *Sp.*, ligamentos redondos.

Definition.—The round ligaments are two fibro-muscular cords which spring from the superior angles of the uterus, extend forward and outward to the internal inguinal ring, and pass through the inguinal canal to reach the anterior aspect of the symphysis pubis, where they terminate in fibrous expansions which are lost in the substance of the mons Veneris.

These structures, the anatomy of which is commonly dismissed in a few words, deserve a careful description, because of the importance that they have recently assumed in connection with Alexander's operation.

Each ligament appears as a somewhat flattened cord, which remains of quite constant size in the same subject (and, in fact, in different subjects) until after it has entered the inguinal canal, when it tapers gradually, and at its point of exit varies greatly in size and distinctness. Its length varies from four to five inches.[2]

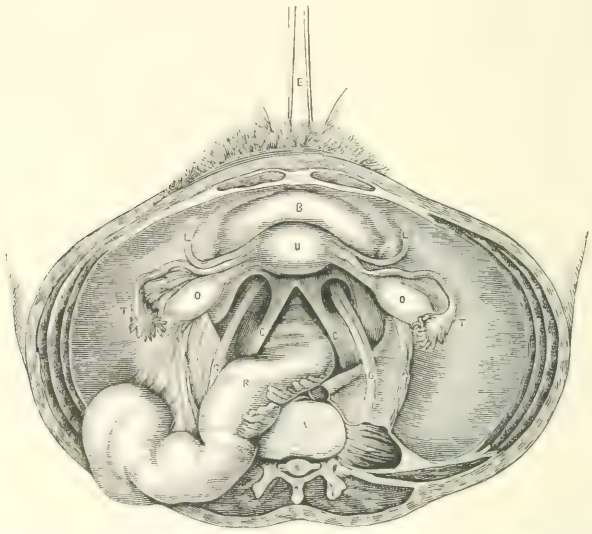
For convenience of description, the ligament may be divided into three portions—that part which lies within the pelvic cavity, that within the inguinal canal, and the terminal portion. The pelvic division of the ligament is attached to the anterior aspect of the upper angle of the uterus, in front of, and immediately below, the origin of the Fallopian tube. Lying at first in the anterior fold of the broad ligament, it curves upward and outward, then forward and inward, to reach the internal ring. In the latter part of its course it leaves the broad ligament, and, enveloped in a fold of peritoneum, runs near the lateral wall of the pelvis, lying well to the outer side of the bladder even when that organ is distended; it crosses the external iliac and obliterated hypogastric arteries, and at the internal ring has the same relations as the spermatic cord in the male, the epigastric artery curving around it on its inner side. At its origin the ligament is large

[1] Savage, *op. cit.*, p. 92.

[2] Madame Boivin has stated that the right ligament is slightly shorter and thicker than the left.

and fleshy, and has a somewhat triangular shape on cross-section; before leaving the broad ligament it becomes smaller and more cylindrical. Within the inguinal canal (the length of which is one and a half inches) it is nearly round, and tapers gradually toward the external ring. Its relations within the canal are identical with those of the spermatic cord. The fold of peritoneum that envelops the intrapelvic portion of the ligament forms a slight depression at the internal ring, but does not usually extend beyond this point in the adult, although in the fœtus after the fifth month it regularly accompanies the ligament throughout the canal, like the processus vaginalis in the male. This

FIG. 52.



Horizontal Section of Body, showing uterus and round ligaments (Savage): *B*, bladder; *U*, uterus; *C*, *C*, utero-sacral ligaments; *L*, *L*, round ligaments; *O*, *O*, ovaries; *T*, *T*, tubes; *R*, rectum.

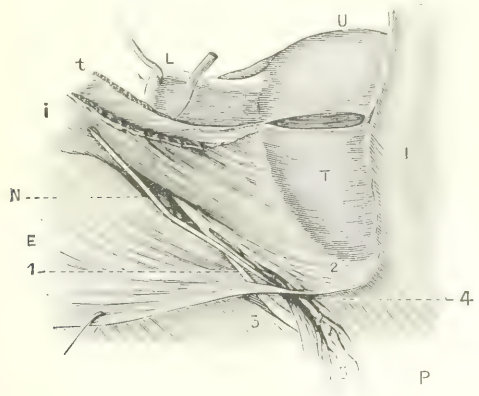
tube of peritoneum is occasionally persistent in the adult, when it is known as the canal of Nuck.[1]

On emerging from the external ring the ligament lies close to the outer side of the pubic spine, which forms the surgical guide to it in Alexander's operation. On reaching the anterior aspect of the symphysis it breaks up into a number of fine strands, which are lost in the fibrous tissue of the mons and upper portion of the corresponding labium majus. At the edge of the ring fibres are often given off which are attached to surrounding parts. Three sets have been described and figured—an external, an internal, and a median, the former of which

[1] The importance of this persistence of the peritoneal sheath in connection with the operation of shortening the round ligaments is at once evident.

blend with the outer pillar of the ring close to Gimbernat's ligament the latter terminate in the upper portion of the external ring, while the internal terminal fibres enter the conjoined tendon. Rainey[1] in his description of the round ligament regards that structure as formed by the coalescence of these three sets of fibres. It seems more correct to

FIG. 53.



Pubic Termination of the Round Ligaments: *P*, pubis where covered by pubic portion of aponeurosis of interior oblique muscle; *U*, fundus uteri; *L*, uterine extremity of round ligament; *E*, aponeurosis of external oblique muscle; *i*, internal oblique muscle; *t*, transversalis muscle; *r*, rectus muscle; *N*, genital branch of genito-crural nerve; 1, external terminating fibres of round ligament into outer pillar of internal ring near Gimbernat's ligament; 2, internal terminating fibres into conjoined tendons of internal oblique muscle and transversalis muscle, near pubis; 3, middle terminating fibres into upper part of external ring; 4, internal pillar of external ring; 5, vessels of round ligament, nervous filaments, and middle terminal fibres of round ligament descending into pudendal sac. (Savage.)

reverse this order. As it emerges from the external ring the ligamentum rotundum has the same coverings as the cord in the male, with the exception of the cremaster muscle—viz. the integument, superficial fascia, intercolumnar fascia, transversalis fascia, and, lastly, the subperitoneal fat. In fat subjects the areolar tissue around the ring may be so loaded with adipose that it is difficult to distinguish the ligament; moreover, its size, color, consistency, strength, the point at which it splits up into its terminal fibres,—all of these are subject to normal variations, as the writer has satisfied himself by dissections and operations on the cadaver.

The genital branch of the genito-crural nerve lies first to the outer side, and then in front of the ligament on its emergence from the canal; a little lower down is a plexus of small arteries and veins, among which are several nerve-filaments. The vascular supply of the cord is derived from several sources. Near the uterus it receives

[1] "On the Structure and Use of the Ligamentum Rotundum Uteri." *London Philosoph. Trans.*, 1880, p. 515.

a branch from the ovarian artery that enters the muscular substance and extends in it along the inguinal canal; at the internal ring it has a branch from the deep epigastric which supplies the exterior of the ligament and runs upward to reach the uterus, where it anastomoses with a branch of the uterine artery. A corresponding vein runs with the artery (Fig. 42). In addition, a plexus of veins from the pampiniform surrounds the pelvic portion of the ligament and sends branches along the canal. The lymphatics are derived from the uterine plexuses: they surround the cord throughout its entire extent and terminate in the superficial inguinal glands. The upper portion of the ligament receives sympathetic nerve-filaments from the same plexuses that supply the muscular substance of the uterus, while the genital branch of the genito-crural sends filaments to its terminal portion.

Structure.—The basis of the ligament is a firm fibrous tissue which we may trace either from the uterus downward, or from the mons and borders of the external ring upward. Near the uterus the ligament has a well-marked covering of smooth muscular tissue, derived from the superficial uterine layer. This covering persists as far as the internal inguinal ring, beyond which point it is not easily distinguishable. Rouget claims to have found striated muscular fibres in the areolar tissue covering the lower end of the ligament; he says that they are derived from the transversalis muscle. Sappey says that "striated fibres come from the lower part of the inguinal canal and from the pubic spine, and ascend to the uterus, but generally disappear at the level of the superior strait." These, he affirms, are surrounded by the layer of smooth muscle derived from the uterus, "like the sleeve of a coat." The peritoneal envelope of the ligament, as was stated, is usually wanting below the internal ring.

The anatomy of these cords has attracted considerable attention in connection with Alexander's operation. They are more developed in multiparæ, as they increase in size during pregnancy and do not return to their original size after delivery. The amount of "slack" of the ligament—if it may be so expressed—allows it to be drawn out of the external ring to the extent of three or four inches. The relations of the intrapelvic portion of the ligament to the peritoneum are important; the latter envelops the cord as far as the internal ring, or forms a sheath for it throughout the canal (as the canal of Nuck). Fortunately, this peritoneal sheath can be stripped off quite readily if it is drawn through the external ring with the cord.

The appearance of the round ligament, as exposed in the incision for Alexander's operation, varies greatly, being sometimes a prominent reddish cord, at others a bundle of indistinct, scattered fibres. In very fat subjects, in whom the external ring is filled with a mass of adipose tissue, the difficulty is obvious. It should be observed that the guide

to the ligament is the external ring, which is found according to the usual method, the pubic spine serving as the surgical landmark. The blood-vessels which accompany the cord may lead to its identification in cases of doubt.

The Uterine Appendages.

Under the term "uterine appendages" most writers include both the tubes and the ovaries. We shall adopt the ordinary surgical phraseology, reminding the reader, however, that the relations of the two organs to the uterus are essentially different. The tubes are the true "appendages," in the sense that they are originally developed from the uterus and represent the continuation of that organ; the ovaries, on the contrary, are developed independently of the womb, and have no direct connection with it.

Fallopian Tubes.

Synonyms.—Oviducts, uterine tubes; *Gr.* ὑστεροσάλπιγγες; *Lat.*, tubæ Fallopianæ, oviductus muliebres, cornua uteri, vasa deferentia mulieris, etc.; *Fr.*, trompes Fallopiennes, ou utérines; *Ger.*, Eileiter, Muttertrompete; *It.*, trombe di Fallopio; *Sp.*, trompas de Falopio.

Definition.—Two sinuous tubes, of varying dimensions, which extend outward from the superior angles of the uterus along the upper borders of the broad ligaments, almost to the edges of the pelvic brim.

The tubes vary in length from three to five inches, the right being slightly longer than the left and lying a little lower in the pelvis. Their general direction is first directly outward, then backward and inward, so that each tube has been compared to a shepherd's crook. Three portions are presented for study—the isthmus, ampulla, and fimbriated extremity. The isthmus is the narrowest part of the tube, immediately adjacent to the uterus, and is about an inch in length; it extends from the ostium internum through the uterine wall at the cornu, and then directly outward to the ampulla. It is of a firm, cord-like consistency, and has a diameter of about three millimeters. The lumen is extremely small, only admitting the finest bristle. The ampulla is the outer dilated portion of the tube, its direction being outward, then forward and downward. The diameter varies from six to eight millimeters, while the lumen expands to a diameter of two or two and a half millimeters. The fimbriated extremity (infundibulum, pavilion) is a funnel-shaped expansion surrounded by a fringe of peculiar fleshy processes (fimbriæ), which recall in a striking manner the tentacles of a sea-anemone. The larger processes (four or five in number) are known as "primary" fimbriæ; others, which arise from the

primary, are called "secondary" fimbriæ, and vary in number from eight to ten. The longest of the former lies to the inner side of the ostium, and is attached to the outer end of the ovary (fimbria ovarica). It forms a groove terminating at the ostium. A small fibrous band, stretching from the infundibulum to the lateral wall of the pelvis, is known as the infundibulo-pelvic ligament.

The tube has two openings—an internal or uterine, which is found at the superior angle of the uterine cavity, and is of very small size; and a distal opening, the ostium abdominale, already described. Quain states that "a second smaller fimbriated opening not unfrequently occurs at a short distance from the main one."[1]

By making numerous transverse sections of the tube the lumen will be seen to vary in diameter at different points, the narrowest part being at, or near, the uterine opening. Remaining of nearly constant size as far as the middle of the isthmus, it then expands suddenly toward the ampulla, where it becomes large enough to admit an average uterine sound. The distal opening is only apparently larger because of the distensibility of the tube at this point.

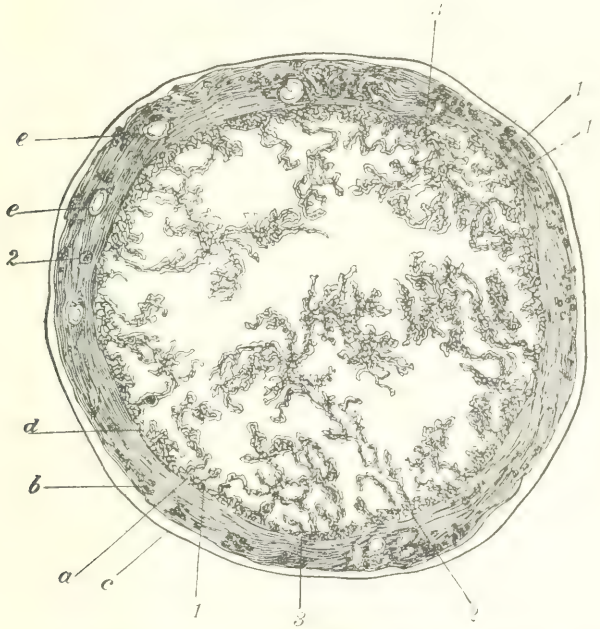
ANATOMY.—A. *Gross.*—The tube is essentially muscular in its structure, resembling closely the uterus, from which it is an outgrowth. Beneath the serous covering is an outer longitudinal layer, derived from the external muscular stratum of the uterus, and an inner layer of circular fibres which forms the direct continuation of the inner uterine layer. Lining the interior of the tube is a thick layer of mucous membrane, which, being very vascular, is normally of a rosy-red (?) color. After a careful examination of many healthy and diseased tubes immediately after their removal, with a view to determining the normal appearance of their lining membrane, the writer has come to the conclusion that it is extremely difficult to decide this question. In every case in which a ligature is placed around the proximal end of the tube the mucous membrane of the excised portion beyond the ligature is so congested that it appears of a dark-red or bluish color; the same hue is observed in the tubes of women who have died suddenly during menstruation. On the other hand, in specimens removed from the cadaver the membrane is certainly much paler than it is during life. This fact is of importance in connection with the diagnosis of "catarrhal salpingitis," one which is frequently made at the present day by laparotomists.

The membrane is disposed in the isthmus in the form of single longitudinal folds, which in the ampulla assume a more complex structure that is best studied in a cross-section of the tube, observed under a low power of the microscope. Springing from the primary rugæ are numerous secondary and tertiary folds, which present an

[1] *Anatomy* (9th ed.), p. 713. The writer has never observed this anomaly.

appearance almost identical with that of a section made through the wall of a proliferating ovarian cyst. Henning[1] says that he has counted from three to five primary folds and from eight to ten smaller plicæ "between each pair of the former." This statement is somewhat obscure, but the author probably means that these smaller folds spring from the surface of the mucous membrane, and not from

FIG. 54.



Section through Ampulla (Luschka), under low power: *a*, submucous layer; *b*, muscular layer; *c*, serous coat; *d*, mucous membrane; *e*, *e*, vessels; 1, 1, small primary folds; 2, 2, larger longitudinal and accessory folds; 3, 3, small folds united, forming canaliculi.

the larger projections. There are no rugæ in the intramural tract of the tube. The dendritic arrangement becomes less marked toward the fimbriated extremity, where the longitudinal folds are quite distinct to the naked eye.

The surface of the mucosa is covered normally by a thin layer of grayish mucus, which has a distinct alkaline reaction. The variations in the amount, color, and viscidity of this mucus cannot be definitely stated, and constantly give rise to loose diagnoses of "catarrhal salpingitis." In spite of Bandl's assertion, that he had found catarrh of the tubes in more than half of the specimens that he had examined, the writer believes that one is unwarranted in assuming the presence of a pathological condition of the tubes because of a slight congestion and

[1] *Krankheiten der Eileiter und die Tubarschwangerschaft*, Stuttgart, 1876.

increase in the amount of mucus, both of which occurrences are normal during menstruation. Certainly, no one is justified in making the diagnosis of catarrhal salpingitis simply from a gross inspection of the organs.[1]

B. *Minute.*—By a comparison of cross-sections of the tube made at different points it will be apparent that its wall is not of the same thickness throughout. The serous covering extends over the entire tube, ceasing at the ostium abdominale, where it is directly continuous with the mucous lining of the fimbriæ; the transition from the flat cells of the peritoneum to the ciliated columnar epithelium of the mucosa is quite abrupt. The peritoneal covering of the tube is strengthened by an increase in the usual amount of fibrous and elastic tissue, and contains a rich capillary network, which can readily be demonstrated without special injections.

The muscular coat of the tube is much thicker in the proximal than in the distal half. The internal, or circular, layer is especially developed at the uterine opening, where a collection of fibres has been described under the name sphincter tubæ.[2] In a cross-section the outer muscular stratum will be recognized by the presence of the divided spindle-cells, the inner by the groups of cells that are arranged in rows parallel with the circumference of the tube. As in the uterine wall, the circular layer contains the principal vascular plexuses; the divided ends of the arteries and the large gaping veins, surrounded by their zones of fibrous and muscular tissue, present appearances quite similar to those in the uterus. In addition to the smooth muscle, there is a considerable amount of connective tissue in the tubal wall, which is distributed between the bundles of muscular fibres around the vessels and beneath, as well as in, the mucosa. Klein appears to regard the longitudinal stratum as essentially fibrous in character, with a few scattered bundles of smooth muscles.

The mucous membrane of the tube resembles that of the uterus in possessing no well-marked submucosa. Its relation to the subjacent muscle is not so intimate as in the body of that organ, but is more like that of the cervical canal. Although they contain a considerable amount of fibrous tissue, the plicæ in the tube are not so essentially fibrous in their structure as are those forming the arbor vitæ. Under the microscope the membrane is seen to be covered by a single layer of ciliated columnar cells, beneath which are two or three supporting layers of cells round and pyriform in shape. The cilia are best observed in fresh scrapings of the interior of the tube. They are frequently observed moving (although slowly) four or five hours after the removal of the tube from the living subject. Their limited vitality in these cases is perhaps due to the effects of the

[1] Comp. Bandl (*op. cit.*), p. 8.

[2] Ibid. (*op. cit.*), p. 2.

ether-narcosis, since that drug is well known to be harmful to them.[1] The presence of its intact lining epithelium, and the persistence and motion of the perishable cilia, are proof positive that no inflammatory process is present in a tube. Moreover, the presence of small collections of mucus-corpuscles on the free surface of the mucosa does not justify the inference that a catarrhal condition is present. The mucous membrane is quite vascular. Sections through the plicæ show that they contain loops of vessels as well as large lymph-spaces.

The arterial supply is derived from the spermatic (ovarian) artery, the distribution of the branches being as follows: As the artery enters

FIG. 55.

Section of the Tube, showing Lymph-spaces (Savage).

the broad ligament, it gives off a special branch to the fimbriated extremity and the outer end of the ampulla; from the ovarian plexus several small twigs run to the middle third of the tube; while the isthmus receives its supply by branches of the main artery and that division of it which runs to the fundus uteri. The veins of the tube enter the pampiniform plexus. The lymphatics unite with those from the ovary. Nerve-filaments reach the tube from the inferior hypogastric plexuses: they have been traced into the muscular tissue, but the manner of their ultimate termination is unknown.

The minute anatomy of the fimbriæ is identical with that of the rest of the tube, and does not require a separate description. The peritoneal connections of the tube (mesosalpinx) will be described with the pelvic peritoneum.

PRACTICAL DEDUCTIONS.—The anatomical relations of the tube enable us to explain the changes which take place as the result of disease. Lying above the ovary and surrounding it, when the tube becomes dilated (as in hydro-, pyo-, hæmatosalpinx, or tubal pregnancy), it sinks, together with the former, to which it is adherent, to a position behind and near the base of the broad ligament, where the

[1] This was first demonstrated by Lister. Landois's *Manual of Human Physiology*, trans. by Stirling, 1885, p. 614).

two form the characteristic sausage-shaped mass which is felt through the vaginal fornix. The shape of this body and its position at the side of the uterus serve to distinguish it to some extent from a prolapsed ovary. The proximity of the small intestine explains the condition which is commonly found on opening the abdomen in the performance of Tait's operation, the tube, ovary, and intestine being matted together by peritonitic adhesions firmly attached to the posterior surface of the uterus or broad ligament. But the tube may not be occluded; its fimbriated extremity may be merely agglutinated to the ovary as the result of a localized peritonitis. In that case there will be no displacement, except of the distal extremity, which will be drawn inward. The relations of the tube to the ovary are not altered even when the latter becomes the seat of cystic degeneration. As is well known, the tube and mesosalpinx are always found on the exterior of the cyst. When the latter is intraligamentous—*i. e.* has grown inward between the folds of the broad ligament—the tube will be closely applied to the surface of the growth, no mesosalpinx being present. If the cyst is parovarian, both tube and ovary will be attached to the cyst.

The tube forms the principal portion of the pedicle, which is tied before the removal of the appendages, for whatever cause the operation may be performed, hence its proximal portion possesses no little interest for the laparotomist. It is usually tied about half an inch from the uterus. There is no advantage in ligating closer to that organ; in fact, the ligature is liable to slip if the latter course is adopted. The needle transfixes the mesosalpinx midway between the tube and the ovarian ligament, the pedicle being tied in two parts, the upper consisting of the tube, the lower of the ligament and the ovarian vessels.

The continuity of the mucous lining of the uterus and tubes, and of the latter with the peritoneum, suggests a direct channel for the transmission of septic and specific infection, to which it is only necessary to allude. The proximal opening of the tube is rarely much dilated, even when the latter is greatly distended. Cases are on record in which fluid injected into the uterus was supposed to have passed through the tubes and into the peritoneal cavity, with fatal results. It is difficult to see how this could occur during the use of a vaginal injection; and even supposing a fluid was injected into the uterine cavity, and its exit through the cervix was prevented, it would require a tremendous pressure to force it through the minute openings of the tubes. In order to be on the safe side, the reader is advised to inject fluids into the uterus only when he is sure that there is a free return-flow. But the fear of an accident, which is certainly exceedingly rare, should never deter us from the judicious use of intra-uterine injections

when these are indicated. Catheterization and cauterization of the tubes, as proposed by Tyler Smith and Froriep, are of course of no practical value, not to speak of the difficulty and danger of the procedure.

The anatomy of the Fallopian tubes is not unimportant practically. The muscular coat may become the seat of hypertrophy (for which condition Mundé has suggested the term "pachysalpingitis"), or it may be greatly thinned when the tube is dilated by accumulations of fluid or the growth of a misplaced ovum. Rupture in the latter case is attended by hemorrhage from the vessels at the placental site, which is often fatal.

The dominant influence over menstruation claimed for the tubes by Mr. Tait gives them a far more important position physiologically than they held a few years ago. Their highly congested appearance during menstruation (especially marked in the mucous lining) must not be mistaken for disease. The diagnosis of "catarrhal salpingitis," as before stated, is sometimes made on insufficient grounds, since the mucous membrane is normally quite vascular and is covered with a layer of mucus. If moving cilia are found in a tube soon after its removal, there can be no extensive inflammation of the mucosa.

Ovaries.

Synonyms.—*Gr.* ὠάρια; *Lat.*, ovaria, testes muliebres; *Fr.*, ovaires; *Ger.*, Eierstöcke; *It.*, ovaje; *Sp.*, ovarios.

Definition.—The ovaries are a pair of small oval bodies situated on either side of the uterus, in the posterior folds of the broad ligaments, below the distal extremities of the tubes.[1]

Position.—The ovaries are situated normally either immediately below the plane of the pelvic brim or partly above and partly below.[2] The true position of the vertical axis of the ovary has formed the subject of no little controversy. Olshausen maintains that it extends outward and backward, forming with the transverse axis of the uterus an angle that opens backward. Hasse, on the contrary, believes that the direction of the axis is outward and forward. Kölliker describes the axis as parallel with the iliac vessels, and figures the ovary as not only occupying an oblique position with regard to the uterine axis, but as being also tilted in such a manner that its surfaces look inward and outward and its rounded border upward and forward. Schultze figures the ovary with its long axis at right angles to the transverse axis

[1] Small accessory ovaries have been observed by Hermann, Beigl, De Sinéty, and others. These are probably not separate organs but rather detached portions of ovaries, the anomaly being explained by irregularities of development.

[2] One-half of the ovary is above the plane of the brim, according to Hart and Barbour.

of the pelvis, while His even insists that it occupies normally a vertical position, its rounded border looking directly backward. The writer has never been able to satisfy himself that the normal position of the organ is the one last mentioned, and that it is not the result of some previous localized inflammation resulting in the formation of slight adhesions, such as are more often present than absent in subjects examined at the autopsy-table. In fact, it is hardly possible to affirm dogmatically that a certain position of the ovary is normal, and that all other positions are abnormal, any more than this can be urged of the uterus. The ovaries are certainly not fixed organs, and are subject to normal variations in their position, although within circumscribed limits. The reader may content himself with the statement that the axes of the organs do not lie exactly in the transverse axis of the pelvis, but slightly oblique to it, while at the same time there is a nutation, or inclination forward.

Relations and Attachments.—The ovary may be regarded as lying in the plane of the pelvic brim. It is described by Spencer Wells as situated in a depression in the posterior fold of the broad ligament; perhaps it would be more correct to say that it lies in front of it, being attached by its anterior border or hilum to the anterior fold. In front is the anterior fold of the broad ligament, separated from the ovary, except at the hilum, by a plexus of vessels and nerves. The round ligament also crosses in front of the organ. Above and somewhat in front is the Fallopian tube, separated from the ovary by the mesosalpinx above and by the parovarium on the outer side. The tube encircles the outer extremity of the organ, so that the fimbriated portion finally lies below the convex border. The left ovary is in contact with coils of small intestine (at least when the bladder is empty); the right is in close relation to the rectum, especially when the latter is distended. The inner extremity of the ovary is connected with the cornu of the uterus by the ovarian ligament, a small fibromuscular cord about an inch in length, which springs from the lateral border of the uterus immediately below the origin of the Fallopian tube, and receives unstriped muscular fibres from the external layer of the uterus, and fibrous tissue from the tunica albuginea of the ovary. It lies in the posterior fold of the broad ligament, and receives a complete peritoneal investment. Hart and Barbour regard it as simply a "longitudinal fold of the peritoneum, into which the unstriped muscular fibre of the uterus is prolonged." The upper border is continuous externally with the ovarian fimbria which connects the ovary with the infundibulum. The lower border is continuous with the infundibulo-pelvic ligament.

The ovary is usually designated as an oval body. It is more properly described as a "flattened ovoid," one-third of one lateral

segment of which is replaced by a straight side (Spencer Wells), the broad, rounded end being directed outward, while the smaller, pointed extremity extends toward the uterus. Both the anterior and posterior surfaces are convex, the latter being the broader and more rounded of the two. The organ is subject to many variations in shape. It may be fusiform, globular (like an oblate spheroid), discoid, or of a strictly oval form.

The size varies with the age of the subject, the functional activity of the organ, the occurrence of menstruation, pregnancy, etc. According to Henning, the ovary attains its largest size six weeks after parturition, when its ordinary dimensions (especially its length) may be doubled, and it never returns to its original size after involution. After the menopause the organ shrinks to one-half, or one-third, of its dimensions during sexual activity, and assumes a somewhat fusiform shape. The average measurements given by Farre are: Length, $1\frac{4}{12}$ inches, width, $\frac{10}{12}$ths of an inch, thickness, 1 inch. Luschka states that the average is: Length, 4 centimeters, width, 2.2 centimeters, thickness, 1.3 centimeters. The weight of the normal ovary varies from 60 to 135 grains, the average weight in a healthy nullipara being 87 grains.

The color of the ovary is well described by Tait as "a pinkish, pearly hue, with here and there a hazy blueness showing through the tissue, when a follicle is either getting ready for the discharge of its nucleus or is disappearing after having fulfilled its function."[1] This description applies rather to the quiescent organ in the virgin or young nullipara. During menstruation it appears of a darker hue, while the ripe Graafian vesicles assume a purple color, which changes to a dark-red or brown after the discharge of their contents; yellowish spots represent so-called corpora lutea. After the menopause the ovary becomes of a whitish color and almost cartilaginous consistence. Before puberty its surface is uniformly smooth, but as menstruation occurs it becomes covered with depressions and cicatrices, marking the sites of the ruptured vesicles, until the senile organ is transformed into a hard, irregular mass of scars and nodules.

Anatomy.—A. *Gross.*—In approaching this subject, it may be well to remind the reader that much confusion exists at the present time with regard to what constitutes a perfectly normal ovary. Judged by the ordinary standards of anatomical normality, such an organ is rarely found either in the dead-house or at the operating-table. Even when it appears on gross inspection to offer no departure from the normal, histologically there may be found in an ovary changes that would be regarded as pathological if found in other organs. On the other hand, ovaries that are apparently the seats of degenerative changes may discharge their functions so perfectly as to satisfy the demands of all except

[1] *Diseases of the Ovaries* (4th ed., p. 5.

the ardent laparotomist. In other words, the boundary between the normal and pathological is not a fixed one, and in spite of numerous careful studies of the subject there yet remain many mooted points. Many of the classical drawings that have been copied by several generations of writers are largely diagrammatic, having been constructed as the result of careful comparisons instituted between sections of the human ovary and those of the lower animals, especially the cat. This caution may serve to soften the disappointment experienced by the student after his repeated failures to hit upon sections that correspond exactly with the familiar illustrations of the textbooks. The microscopist who succeeds in determining to what extent an ovary may contain cysts without being "cystic," and just how much fibrous tissue must exist in its stroma before the diagnosis of "cirrhosis" is justifiable, will deserve no little praise.

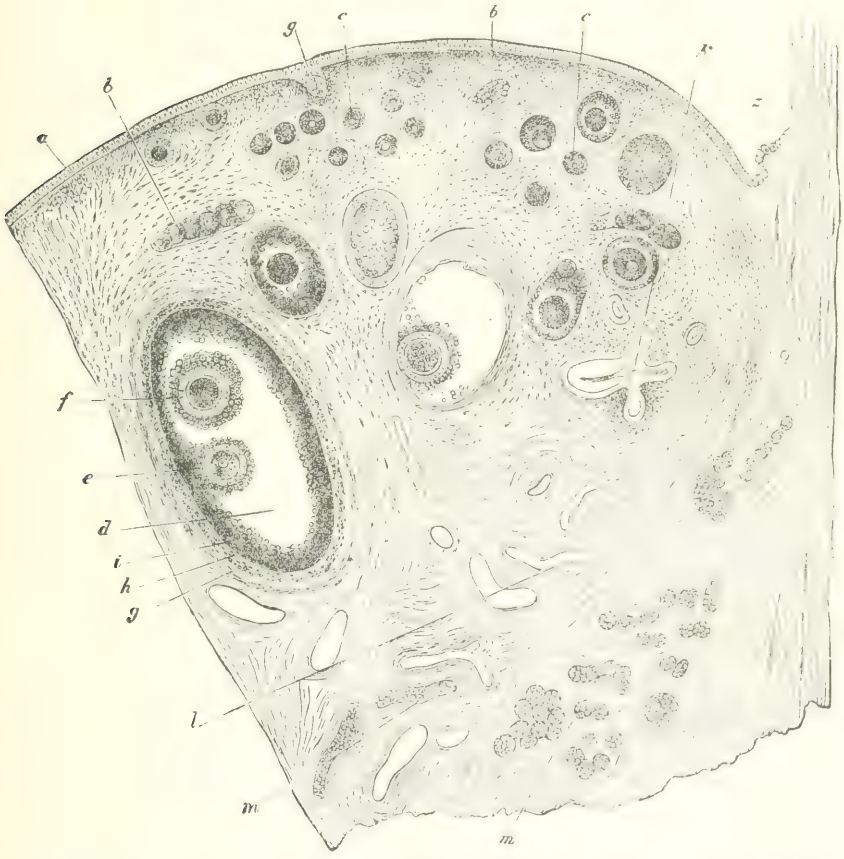
In describing an ovary we may consider its extremities, borders, and surfaces, two of each. The inner extremity, which is distant about an inch from the uterus, is long and pointed, and tapers gradually into the ovarian ligament. The outer is thickened and rounded, and is situated more posterior, with reference to the transverse axis of the pelvis, than the inner; to it is attached the fimbria ovarica before mentioned, which is sometimes regarded as one of the ovarian ligaments.

The borders of the ovary are designated "upper" and "lower," and its surfaces "anterior" and "posterior." Considering the true position of the organ, it is more correct to reverse the terms, the surfaces being termed upper and lower. The posterior border is convex, and is free, or not covered by peritoneum; the anterior is straight, somewhat flattened, and is attached to the posterior fold of the broad ligament. It is known as the hilum, and is the portal through which the vessels and nerves of the organ enter. The superior surface is nearly flat, and looks upward and forward, while the posterior is decidedly convex and is directed downward and backward.

On making a longitudinal section of an ovary from a healthy adult there will be presented two zones of tissue—a central and a peripheral. The former has a pinkish-gray or even rosy hue, is of soft consistence, and has a moist, glistening appearance. The peripheral zone is white or grayish-white, and has a firm, semi-cartilaginous (or, more properly, ligamentous) structure. The former is evidently well supplied with vessels, especially near its margin, while the latter seems to be non-vascular. A closer examination of the cut surface will reveal the presence of numbers of small pits and vesicles of variable size, those near the periphery being the smallest as well as the most numerous; imbedded in the central portion of the surface are several of these cystic bodies of much larger size, while in the peripheral zone are a few vesicles, the size of small peas, which are filled with clear fluid.

The latter bodies project more or less above the free surface of the ovary, and one or two of them will generally be so distended with fluid and thin walls that they rupture on the application of slight pressure. In the periphery will also be seen the remains of ruptured ovisacs in all stages of retrograde metamorphosis, from a blood-clot to a firm, bloodless cicatrix. The general disposition of the bands of fibrous tissue in the stroma are also evident to the naked eye, although

FIG. 56.



Section of the Ovary of an Adult Bitch: *a*, germ-epithelium; *b*, egg-tubes; *c*, *c*, small follicles; *d*, more advanced follicles; *e*, discus proligerus and ovum; *f*, second ovum in the same follicle (this occurs but rarely); *g*, outer tunic of the follicle; *h*, inner tunic; *i*, membrana granulosa; *k*, collapsed retrograded follicle; *l*, blood-vessels; *m*, *m*, longitudinal and transverse sections of tubes of the parovarium; *g*, invaginated portion of the germ-epithelium of the surface; *x*, place of the transition from peritoneal to germinal or ovarian epithelium. (Waldeyer.)

the more complex interlacement is only apparent under the microscope. These fibres not only radiate in all directions from the hilus, but also surround the ovisacs and vessels. The vascular richness of the organ is best appreciated in injected specimens, but the divided ends of

numerous arteries will be seen on the cut surface of the ovary even in its natural state.

B. *Minute.*—The microscopical anatomy is so important that the writer feels justified in devoting to it what may seem like a disproportionate amount of the limited space at his disposal.

Three points are presented for study—the exterior of the ovary, the fibrous (or fibro-muscular) tissue, and the Graafian vesicles. The external covering is best observed in fresh preparations that have been specially stained. Contrary to the opinion of Waldeyer, Leopold, Klein, and many other microscopists who have carefully investigated the matter, Mr. Tait confidently affirms that "the posterior surface, when treated by silver and other staining methods, displays the same stomata and stigmata as does the anterior surface"—in short, that the ovary is entirely covered by a layer of peritoneum, the presence of which on the posterior surface can be recognized by finding the squamous epithelium which is characteristic of that membrane.[1]

Without entering into a discussion in which the weight of evidence is decidedly against the writer just quoted, it may be stated that most authorities are in accord in the belief that the free surface of the organ (*i. e.* the posterior surface, which projects beyond the hinder fold of the broad ligament) is covered by a single layer of short columnar epithelia, which has received from Waldeyer the name "germinal epithelium," because, in his opinion, the primitive ova are developed from it, the young ova themselves being represented by the occasional large spheroidal cells with prominent nuclei which are observed among the columnar cells.[2] These are most numerous in the ovaries of young girls, in which ingrowths of the germ-epithelium into the underlying stroma are sometimes seen (ovarial tubes of Pflüger). At the attached border of the ovary (the so-called "white line") there is an abrupt transition from the columnar to the squamous epithelium of the peritoneum.

The epithelial layer rests directly upon the tunica albuginea, a thin layer of condensed fibrous tissue containing a small number of smooth muscular fibres; although this capsule is quite sharply differentiated from the underlying stroma, the two are inseparable. The albuginea does not become completely developed until the third year. It undergoes changes corresponding with the age of the subject, becoming, as the result of prolonged ovulation and senile atrophy, so dense as to resemble fibro-cartilage. This physiological change is undoubtedly often regarded as pathological by superficial observers. Henle[3] states

[1] *Op. cit.*, p. 6.

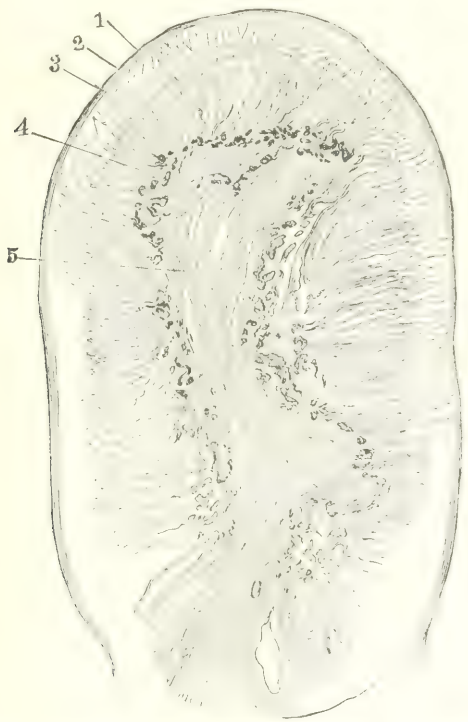
[2] Waldeyer, *Eierstock u. Ei*, Leipzig, 1870; also *Stricker's Handbuch*, p. 545.

[3] *Handbuch der Eingeweidelehre.*

that in man three separate layers are distinguishable in the albuginea, the fibres of the outer and inner being longitudinal, while those of the middle layer have a circular direction.

The ovarian stroma or parenchyma is divided into two zones—an outer grayish cortical (parenchymal zone), and an inner pinkish medul-

FIG. 57.



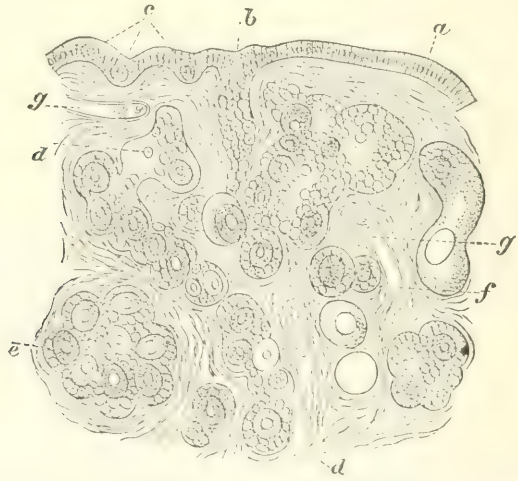
Longitudinal Section of the Ovary, under a low power (Henle): 1, albuginea; 2, fibrous layer of cortical portion; 3, cellular layer of cortical portion; 4, medullary substance; 5, loose connective tissue between the firm medullary layers.

lary (zona vasculosa). There is no essential difference between the structure of the two, except that the latter is softer and more vascular.

The cortex is composed of bundles of connective tissue, among which are scattered elastic and muscular fibres; imbedded in the tissue are numbers of Graafian vesicles of the smallest size. Under the microscope the cortical zone presents an outer layer (called by Henle the "fibrous" layer), in which the fibrous tissue is firmer than in the deeper portion, the bundles of fibres forming a dense network. In the deeper part of the cortical zone the connective tissue is looser and has a radiating appearance from the centre toward the periphery. A curious feature of the tissue here is the presence in it (especially in the vicinity of the vesicles) of numbers of cells, both round and fusiform,

some of the latter possibly representing bundles of smooth muscle-fibres. There was formerly much difference of opinion as to the significance of these spindle-cells, many authorities denying that they were fibre-cells. There is little doubt that the stroma contains a considerable amount of muscular tissue, which is most abundant in the neighborhood of the larger vessels. The majority of these fusiform cells, which have prominent oval nuclei, doubtless belong to connective tissue in an early stage of development. This inference is justified, 1, by the fact that the cells are, as a rule, shorter and broader than the fibre-cells in the muscular strata of the uterine wall; 2, by the variable size of the cells, some of which are short and nearly oval in shape, while others are long and tapering, showing that there is some process of growth or development going on among them; 3, the cells are seldom arranged in groups, as in smooth muscle, but are scattered throughout the connective tissue, to which they bear an intimate relation. Some authorities go so far as to say that all of the spindle-cells in the stroma represent muscular tissue. Of the round and polyhedral cells scattered throughout the stroma, some are leucocytes, while others come from the fœtal Wolffian body and are analogous to the interstitial cells of the testicle; some of the round

FIG. 58.



Vertical Section through the Ovary of a newborn Infant (Waldeyer): *a*, germinal epithelium; *b*, ovarial tube; *c*, primitive ova; *d*, longer tubes becoming constricted to form Graafian vesicles; *e*, large cell-nests; *f*, isolated ovisacs; *g*, *g*, blood-vessels.

cells, as well as the fusiform, undoubtedly belong to the young connective tissue type. Into the cortical zone (in the ovaries of young subjects) project those curious cell-columns before alluded to under the name "ovarial tubes." They are simply ingrowths from the layer of germ-epithelium, with which they are directly continuous. A detailed

description of these belongs rather to the province of embryology.[1] From the large number of small ovisacs that exist in the cortical layer it has been called by Sappey *couche ovigène*. But not all of these bodies deserve the name of Graafian vesicles, since many of them represent merely collections of embryonal cells that have not yet reached the dignity of fully-formed vesicles, while others are groups of fatty degenerated epithelial cells. The vesicles will be described separately. The vascular supply of the cortex is not so rich as that of the medulla. The larger and medium-sized arteries are surrounded by fasciculi of elastic and muscular fibres. Each of the ovisacs is surrounded by a fine network of capillaries.

In the medullary portion of the ovary the character of the stroma undergoes a change; it becomes looser and more vascular. Although the tissue contains the same elements as in the parenchyma, the bundles of fibrous and elastic tissue and smooth muscle-fibres are not so close together, but interlace in all directions. The non-striped muscle may be traced directly through the hilum (with the blood-vessels) into the broad ligament. The bands of fibrous tissue also radiate from the hilum, as well as the nerves and vessels. The blood-vessels of the parenchyma are large and numerous. Entering the ovary at the hilum, the arteries pursue a spiral course through the stroma, their branches terminating in capillary networks around the vesicles. The veins, which begin in small efferent twigs from the above-mentioned plexuses, are tortuous like the arteries, and may be traced to the hilum, where they leave the ovary to enter the bulb. The lymphatic supply of the parenchyma is particularly rich. By means of proper injections the distribution is seen to be similar to that of the arteries and veins. Each vesicle is surrounded by a fine network of lymphatics, while the ultimate termination of the system is in the plexuses of the broad ligament. As was stated before, both the arteries and veins present an appearance on cross-section similar to that of the uterine vessels. The lumina of the arteries are small in comparison with their diameters, their fibrous and muscular coats being quite thick, while the veins are imbedded in the fibrous stroma with which they are surrounded. The smooth muscle-fibres are especially distinct around the larger arteries.

The nerve-fibres can be traced from the hilum into the stroma in the vicinity of the larger vessels, but their ultimate endings in man have not yet been described. Elischer of Buda-Pesth has studied the ovaries of the lower animals with a view to settling the question of the termination of the nerves. He states as the result of his observations that medullated fibres after entering the hilum

[1] *Vide* F. M. Balfour, *Treatise on Comp. Embryology*. Quain (*Anat.* 9th ed.) gives a full bibliography.

branch in a dichotomous manner, and lose their medullary sheath when they reach the neighborhood of the vesicles, around which they form loops. The larger the vesicle, the more distinct is its nervous plexus; a fine secondary network arises from the primary filament and rests upon the outer layer of the membrana granulosa. The same observer claims that he has traced the terminal fibrils to the cells of the granular layer, where they probably end in the nuclei. The larger vessels, he says, are also surrounded by plexuses of nerves.

Graafian Vesicles.—The stroma of the ovary constitutes merely the framework or bed in which rest the ovisacs. The former may be said to exist simply for the nourishment of the latter. In order to understand properly the nature of these important bodies, it will be necessary to trace briefly their development and ultimate fate. For details the reader is referred to works on embryology.

Whether the vesicles are formed from ingrowths of the germ-epithelium, according to Pflüger's theory, or, *per contra*, by outgrowths of the stroma into the epithelial layer, as Balfour believes, or, as Klein suggests, by "mutual ingrowth" of both epithelium and stroma, certain it is that at an early stage in fœtal life groups of cells undergo a special differentiation. Some of these cells become enlarged and their nuclei prominent, forming the primitive ova, while others of the same group remain as the membrana granulosa. In the ovary of an infant there is seen immediately beneath the tunica albuginea a granular layer which, when examined under a low power, appears to be filled with minute bodies that represent immature vesicles; still deeper in the substance of the organ are larger vesicles containing ova. Toward the time of puberty these latter vesicles increase in size and advance from the deeper part of the stroma into the cortical zone. They continue to enlarge, make their way through the albuginea (the tissue of the latter becoming atrophied), and form small projections on the surface of the ovary. The fluid contents of the vesicle increase, its wall becomes thinned, especially at one point, toward which the vessels run (stigma), and ultimately rupture takes place.

The mature vesicles vary greatly in size, the largest being about $\frac{1}{20}$th of an inch in diameter, while the smallest may not exceed $\frac{1}{100}$th of an inch. Each vesicle has an external covering of connective tissue (tunica fibrosa, theca folliculi externa of Henle) which may be separated into two layers—an outer, containing the vascular plexuses before alluded to, and an inner, in which are the delicate capillaries that supply nourishment to the ovum. The external stratum is merely a condensation of the stroma, and hence in it are seen numbers of the spindle-cells that fill the tissue of the former; the inner is more complex in its structure, and contains a variety of cells, round, polygonal, stellate, and fusiform. The round cells possess the amœboid property

of leucocytes. The immediate lining of the vesicle is a layer of flat cells with single oval nuclei, external to which is a layer of columnar epithelia. The latter rest upon a delicate stratum of connective tissue known as the membrana propria. The interior of the ovisac is mostly filled by a clear albuminous fluid, in which float a few fatty particles and cells (liquor folliculi), while at one side of the cavity (generally that most removed from the surface of the ovary) there will be seen a delicate transparent body—sometimes two, rarely three—surrounded by a collection of cells from the membrana granulosa, called the discus proligerus. The cells forming the latter have been divided into two layers—the "egg-epithelium," that lies adjacent to the ovum, and the "follicular epithelium," which is external to the former.

The ovum itself has been aptly called "a typical cell." It is a yellow, spherical body having a diameter of about $\frac{1}{20}$th of an inch, surrounding which is a thin hyaline membrane (vitelline membrane, zona pellucida), which is doubtless formed from the innermost cells of the discus proligerus. Within the zona pellucida (in which fine pores have been described) is the vitellus, a mass of granular fibrillated protoplasm containing numerous fat-globules, the central portion of the protoplasm being less opaque than the peripheral. Somewhere on the outer edge of the central zone of the vitellus is a light spot, which under a high power appears as a delicate network of fibrillated protoplasm, in the meshes of which is a quantity of finely granular material, the whole being enclosed in a distinct membrane (nucleus or germinal vesicle). Within the latter is a small, highly-refracting granular body (nucleolus or germinal spot), not over $\frac{1}{3000}$th of an inch in diameter, which occupies the same relative position to the contents of the vesicle that the latter does to the interior of the ovum. When strongly magnified the nucleolus appears only as a mass of finely granular material. This brief description applies to a mature ovisac, such is as seen at the periphery or on the surface of the ovary. Between these and the undeveloped vesicles ($\frac{1}{1000}$th of an inch in diameter) there are ovisacs of various sizes and forms. In the small and medium-sized ones the cavity is entirely filled by the ovum. As the vesicles increase in size the latter becomes larger and occupies a relatively smaller portion of their interior, while the zona pellucida becomes thicker.

It is impossible in this place to study the interesting subject of the degeneration, or arrested development, of the ovisacs. Doubtless the small, irregular collections of epithelial cells scattered about in the stroma, the localized thickenings of the latter (not unlike cicatrices in their microscopical structure), and other anomalous appearances frequently described as pathological, all represent the remains of Graafian bodies that have perished, as it were, in the midst of the stroma,

without ever coming to maturity or being able to reach the surface. The mere mention of these facts will serve to indicate to the reader the possibilities that lie before the original worker.[1]

In considering the unruptured vesicle and its contents we have referred only to the initial period in its history. If such a vesicle be examined just as it is on the point of rupturing, it will be found to be distended to its utmost capacity, while over its thin, transparent wall run engorged capillaries. Immediately after rupture the cavity is filled with coagulated blood derived from the torn vessels. A few weeks later the periphery of the clot has become of a yellowish color, while its centre has more of a reddish-gray hue. The walls of the cavity contract, compress the clot, and thus throw the yellow zone into the convolutions which are so familiar to every one. The mass is now known as the corpus luteum. The yellow ring increases in width, gradually encroaching upon the central portion, until almost the entire mass becomes yellow. As viewed under the microscope the change may be briefly explained as follows: The original peripheral zone of the corpus luteum consists of fatty degenerated cells from the membrana granulosa, into the midst of which penetrate offshoots of fibrous tissue and capillary vessels derived from the wall of the ovisac. In the centre of the clot there will be seen many large pigmented cells and crystals of hæmatoidin, together with newly-formed blood-vessels. Ultimately the pigment disappears, and the fatty cells (which give the yellow tinge to the mass) encroach upon the central zone until it loses its original appearance entirely, and is represented by a small quantity of mucoid tissue. The final stage of retrogression is the transformation of the cells into a mass of fat-globules, the vessels disappearing. The fat is then absorbed, the surrounding fibrous tissue contracts, and a white depressed cicatrix (corpus albicans) alone remains to mark the site of the former vesicle. If the ovum from the vesicle in question becomes impregnated, the degenerative changes are retarded, and the corpus luteum is nourished for some time by the rich development and persistence of the newly-formed vessels; hence it becomes larger than the one just described, while the convoluted appearance of its yellow border is much more striking.[2]

It will be evident to the reader, even after this superficial view of the minute anatomy of the ovary, that its structure is not only a complex one, but that it is not always easy to state when the organ is entirely normal and when it is not. The fact that it is the seat of constant changes, beginning in fœtal life and continuing till after the menopause, should lead us to be cautious in giving an opinion as to

[1] For an ingenious essay on the fate of the ova see Dr. Creighton's paper in the *Journal of Anat. and Physiol.*, vol. xiii.

[2] Refer to Dalton's *Physiology* for details and illustrations.

the presence of abnormal conditions. Whether we examine critically the stroma or the ovisacs, the conclusion is unavoidable that the boundary-line between the normal and pathological is not a fixed one. Thus the degenerative changes consequent upon the senile state may easily be mistaken for cirrhosis, while the diagnosis of cystic degeneration may be made because of the presence of a few vesicles that are somewhat above the usual size, though they may contain perfect ova. The practical deduction is self-evident. The diagnosis of ovarian disease requires for its support the aid of the microscope, as well as a thorough acquaintance on the part of the observer with all of the possible variations in the appearance of the normal organ.

The ovary receives a portion of its blood from the ovarian artery (Fig. 49), which arises directly from the aorta, like the spermatic in the male, and has a course similar to that vessel until it reaches the pelvis. Having reached a point near the pelvic brim, the ovarian artery makes a bend inward, enters the broad ligament, and runs between the folds of peritoneum upward and inward to the upper angle of the uterus. In its tortuous course and in the manner of distribution of its branches it resembles the splenic artery. On reaching the uterus, or just before, it divides into two branches, one of which supplies the fundus and joins the vessel of the opposite side, while the lower and larger branch descends along the lateral border of the uterus, giving off numerous parellel twigs of a curious spiral form, and finally anastomoses with the uterine artery. Soon after entering the broad ligament, the ovarian vessel sends three or four large branches to the distal end of the tube, then a group of extremely tortuous vessels which ramify over the surface of the ovary and enter the hilum. Near the point of division other twigs are given off, which run to the proximal end of the tube, while there is a special branch to the round ligament. It is impossible to give a clear view of the richness of the vascular supply of the pelvic organs and of the intricate anastomosis which takes place between the vessels that run in the broad ligaments. A glance at one of Hyrtl's or Savage's plates will teach more than pages of description. The reader is referred to these as the best substitutes for actual dissections, which latter are not only very difficult, but require careful preliminary injections. Attention should be called to the most marked peculiarity of the ovarian artery, which extends to its minutest branches—its extreme tortuosity. It is hardly necessary to remind the reader of the physiological fact that this peculiarity is one observed in many arteries which supply organs of the turgescent type.[1]

The ovarian capillaries terminate in veins that emerge from the hilum and enter a mass of veins which is situated along the lower

[1] Sappey (*Traité d'Anatomie*, Paris, 1874, tome iv. p. 691) denies the truth of Rouget's assertion that the ovary is an erectile body.

edge of the organ and is known as the "bulb." Savage describes it as a "club-shaped venous body in which the ovary and utero-ovarian ligament are partly imbedded." It communicates freely with the veins from the upper part of the uterus and from the tube (as well as with the uterine plexus), forming with them an intricate network, known as the ovarian or pampiniform plexus. This plexus terminates in the ovarian or spermatic vein, which on the right side empties directly into the vena cava inferior, but on the left joins the corresponding renal vein. There is a well-marked valve at the termination of the right, but not of the left, spermatic vein.[1]

Reference has been made to the distribution of the nerves and lymphatics. The lymphatics of the ovary unite with those from the tube and upper portion of the uterus, and enter the lumbar glands. The nerves arise from the spermatic plexus and accompany the arteries.

Parovarium.

Definition.—A triangular group of small tubules situated in that portion of the broad ligament which intervenes between the outer end of the ovary and the distal extremity of the Fallopian tube. The apex of the triangle touches the upper border of the ovary.

This curious body, analogous in its structure to the epididymis, is usually dismissed by anatomists in a few words as the "remains of the Wolffian body." Doran[2] deplores the general want of interest that prevails with reference to a structure that ought to be regarded by gynecologists as of no little importance, because of its relation to certain morbid growths. The tubes or fibrils forming the parovarium vary considerably in number. There may be only half a dozen, or as many as twenty-five or thirty. They lie in the midst of the delicate cellular tissue which exists between the folds of the broad ligaments, and have no close attachment to any of the surrounding parts. Beginning at or near the hilum of the ovary, they ascend in parallel rows and enter a transverse tube or canal which terminates in a cul-de-sac —sometimes in a cystic dilatation—near the fimbriated extremity of the tube. Beyond the point at which the lumen of this transverse tube disappears, the latter can still be traced as a delicate cord which extends inward toward the uterus, but is lost before it reaches that organ. This is the persistent duct of Gartner, which Doran found in upward of one-fifth of the specimens examined by him. Attempts have been made to trace a direct connection between these ducts and the so-called "Skene's glands" at the meatus urinarius, but Dr. Schüller[3] of Berlin has dis-

[1] For a discussion of the practical significance of this fact, *vide* Tait, *op. cit.*, pp. 7–9.

[2] *Tumors of the Ovary and Broad Ligament*, London, 1885.

[3] *Beiträge zur Anatomie der Weibl. Harnröhre*, Berlin, 1883.

proved the theories of his predecessors. The vertical tubes are of different sizes and show various degrees of development, those which are most internal being generally merely threads of fibrous tissue, while a half dozen or more of the external tubules show under the microscope a well-marked lumen, which is lined by a single layer of ciliated columnar epithelium resting upon a fine membrana propria. The latter consists of fibrous tissue containing a small quantity of smooth muscle: two layers have been described, the outer consisting of circular fibres, while the inner run in a longitudinal direction. This description applies to an exceptionally perfect tubule. As a rule, the lumen, if it exists at all, is filled with a mass of degenerated epithelial cells imbedded in a mucoid fluid. The duct of Gartner is seldom anything more than a fibrous cord. Cystic dilatations are frequently observed in the course of the tubules, the most common being the pedunculated vesicle known as the "hydatid of Morgagni," the pedicle of which springs from a point in the mesosalpinx to the inner side of the fimbria ovarica. It is generally regarded as the result of dilatation of the upper extremity of the fœtal duct of Müller. The other cysts around and within the parovarium are really pathological appearances.

Practical Deductions.—Can the normal ovaries be detected by the bimanual touch? Opinions on this subject vary. In thin subjects the practised examiner may be able to feel them, but we venture to affirm that it is only under the most favorable circumstances that they can be felt through the abdominal wall. By practising the rectal or vesical touch, the uterus and its appendages being at the same time depressed from above or drawn down from below, the gland may often be distinctly recognized. According to Mundé, the normal ovary is not so insensitive as has been claimed, but a peculiar sickening pain can be produced by deep pressure upon it. The mobility of the normal organ, as well as its situation in the pelvis, prevents it from being reached through the vaginal fornix; hence when it is readily felt by the vaginal touch alone, the inference is that it has sunk below its normal plane.

Remembering the rather loose attachments of the ovary, and the fact that it "floats at a certain level" in the pelvis, the etiology of prolapsus becomes almost self-evident. Stretching of the ovarian ligament or increase in weight of the organ (both conditions being a normal accompaniment of pregnancy) will naturally destroy its adjustment and cause it to sink downward. Traction, from displacement of the uterus, adhesions, enlargement and prolapse of the tube, etc., is a common cause. As the ovaries sink downward and backward (the usual course), they rest at first upon the "retro-ovarian shelves," as Polk has called the two sections of the posterior fossa of the pelvis that lie above

the level of the sacro-uterine ligaments; subsequently they may descend into Douglas's pouch. Every reader must have noticed the greater frequency with which the left ovary is thus displaced. This difference is explained by reference to the fact that the left ovary is more often diseased—a fact which depends upon a chain of anatomical causes, not the least of which is the valveless condition of the left spermatic vein, so that this vessel is readily affected by any obstruction to the general circulation. The rectum encroaches on the left retro-ovarian shelf, so that the corresponding ovary tends to glide off from it into the true pouch of Douglas. The anatomical relations of the displaced organ explain the pains which attend defecation, as well as coitus; these are especially aggravated when the organ is fixed in its abnormal position. From the brief statements which were made regarding displacement of a diseased tube, with or without the corresponding ovary, it will be inferred that not only the shape, but the position of a tender body behind the uterus, may give some clue as to whether it is an ovary or a tube. A positive differential diagnosis is seldom possible at the examining-table. Although the circulation in the ovarian vessels is doubtless interfered with when the gland is much displaced, there is probably less obstruction than there would be if they were not so long and tortuous.

When the ovary becomes the seat of tumors, its relations to neighboring organs are greatly changed; still, by remembering them, we are often enabled not only to make a correct diagnosis, but to explain certain complications. Among the points to be borne in mind, the most important is the position of an ovarian tumor (at least before it has grown so large as to fill the abdomen) with reference to the uterus—*i. e.* at the side of that organ. The attachment of the tube and meso-salpinx to a pelvic tumor always gives a clue to its origin, even when its nature is not clear at the time of the operation.

The relations of the ovary to the broad ligament, as well as to the Fallopian tube, indicate fruitful sources of disease; the well-known frequency of localized peritonitis around the distal extremity of the tube requires no comment. Oöphoritis and perioöphoritis are hardly separable; how many of the symptoms observed in these cases are due to disease of the ovary, and how many to the surrounding peritonitis, it is not often possible to decide.

The normal anatomy of the gland should be thoroughly studied at the present day when so many ovaries are removed for real, or supposed, disease. From what has been said regarding the variations in shape, size, and external appearance, it may be inferred that there are many opportunities for error when we attempt to decide delicate shades of difference between the normal and pathological by a hasty inspection of the organ. The normal histology of the ovary is a key to the know-

ledge of the etiology of its diseases. We must be thoroughly familiar with the appearance of the stroma in order to detect hypertrophy of the fibrous tissue; with the Graafian vesicles in order to recognize small pathological cysts; while a study of the epithelial covering is a necessary introduction to that of cyst-formation. The changes in the cortex resulting from the rupture of ovisacs or from senility must be carefully distinguished from the thickenings due to chronic inflammation.

The remarks concerning the general pelvic circulation cover that of the ovary. The arrangement of its vessels is such as to favor sudden and excessive engorgement, which might easily become pathological. Subperitoneal hæmatoma, the result of hemorrhage from the ovarian vessels, is readily conceivable, and doubtless occurs at the time of the menstrual period more frequently than we imagine. Hemorrhage into Graafian vesicles, and thence into the peritoneal cavity, has often been recorded, and Savage has shown by a series of interesting cases how the subovarian plexuses may rupture and fatal hemorrhage ensue. The sudden appearance of acute abdominal pain and collapse during menstruation should at once awaken the suspicion that this accident may have occurred, even when no information can be derived from a physical examination. The treatment, with our modern views on abdominal surgery, is evident. The intimate relation between the vessels supplying the pelvic organs precludes the possibility of engorgement in one without at least some disturbance in the rest. Thus the ovary sympathizes with uterine affections. It is the centre of reflex neuroses which are not always explicable by reference to anatomical facts; mammary pain (generally on the same side as a diseased ovary) is a familiar example.

To the various neoplasms and their origin we can only refer; that they are formed from pre-existing elements will be evident to the student of normal histology.

THE URINARY TRACT.

That portion of the tract which is usually described with the genital organs includes the urethra, the bladder, and the termination of the ureters. These will be considered in the same order as were the genital organs—that is, from below upward.

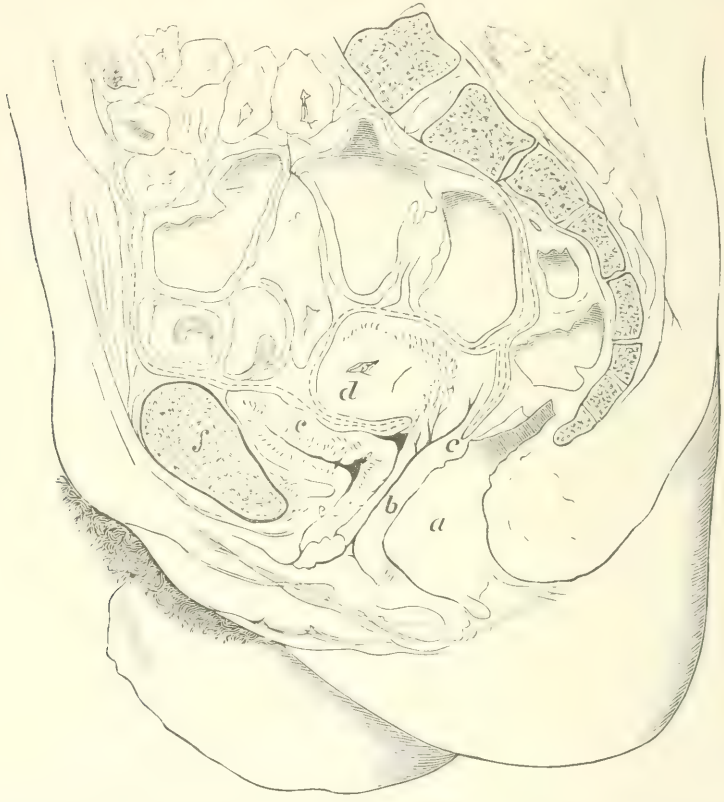
URETHRA.

SYNONYMS.—*Gr.*, οὐρήθρα; *Lat.*, canalis urinarius, urethra, iter urinarium; *Fr.*, urèthre, urètre; *Ger.*, Harnröhre; *Sp.* and *It.*, uretra.

DEFINITION.—The female urethra is a short canal imbedded in the anterior vaginal wall, extending from the meatus urinarius to the neck of the bladder.

In a mesial section of the pelvis the urethra appears as a slit nearly straight, or, as some authors describe it, with a slight sigmoid curve corresponding to that of the posterior vaginal wall.[1] Its course is

FIG. 59.



Frozen Section of the Pelvis, showing contracted bladder and relations of urethra: *a*, anus; *b*, vagina; *c*, bladder; *d*, uterus; *e*, bottom of Douglas's pouch; *f*, symphysis pubis (Fürst).

upward and backward, being "parallel with the plane of the pelvic brim." Henle states that in cross-sections the canal is represented by a transverse slit near its vesical end, while at other points, except at the meatus, the section has a stellate appearance. The average length of the urethra is one and three-eighths inches, the average diameter a quarter of an inch. For the sake of convenience we may consider first the beginning of the canal, then the portion that lies between its two openings, and lastly the vesical extremity.

When in a state of rest the meatus appears as a small dimple, or puckering, of the mucous membrane, situated in the median line at the lower edge of the vestibule, from three-fourths to four-fifths of an inch below the clitoris and an inch in front of the four-

[1] Winckel, *Krankheiten der Weibl. Harnröhre u. Blase*, S. 5.

chette. A cross-section of the canal at this point is represented by a vertical slit. The corrugation of the mucous membrane is not confined to the meatus, but exists throughout the whole course of the urethra when it is not distended. The puckering of the mucosa at the external opening is due to the sphincter action of the muscular fibres which surround it. Around the meatus there will be observed on close inspection several little depressions, which are the openings of the glandulæ vestibulares minores, already alluded to in connection with the vestibule. Just within the meatus are the orifices of a pair of glands described by Dr. Skene.[1] These are simply two of Littré's glands of large size, corresponding to the lacuna major in the fossa navicularis of the penis. They are not always easy to find in the healthy urethra, but in cases of prolapse of the mucous membrane they often stand out prominently. Dr. Skene describes them as tubules, situated just beneath the mucous membrane near the floor of the urethra, and extending upward from the meatus parallel with the canal for a distance of three-quarters of an inch; their function is unknown. They derive a certain pathological interest from the fact that they are sometimes the seat of an inflammatory process, which may long resist treatment until its true site is discovered.

The mucous membrane of the meatus, as well as that of the lower portion of the urinary tract, is covered with pavement epithelium similar to that of the vestibule. The glands (like those near the end of the penis) are lined at their mouths with squamous epithelium, which soon passes into the columnar variety. The venous plexuses around the meatus are apparent even on superficial inspection. The distribution of the vessels and nerves is the same as in other parts of the vestibular area.

The urethra lies beneath the pubic arch, suspended by the pubovesical ligament, and pierces the triangular ligament, to the two layers of which it bears the same relations as the canal in the male. In its anterior three-fourths it is literally imbedded in the anterior vaginal wall, while the upper fourth is intimately connected with the vagina by an intermediate layer of cellular tissue. The fusion of the walls of the two canals results in the formation of the urethro-vaginal septum, which is nearly half an inch in thickness.

Anatomy.—A. *Gross.*—Three layers of tissue are present in the urethral wall, two of which are muscular and the third mucous. An external layer of cellular tissue is sometimes described, but it is well marked only over the upper portion of the canal. The outer muscular layer consists of smooth fibres disposed in a circular manner around the tube, while those of the internal layer run longitudinally. Uffleman

[1] For details and drawings consult Skene's original article in the *Am. Journ. of Obstetrics*, vol. xiii.

describes a double layer of voluntary muscle (the inner fibres being transverse, the outer longitudinal) which extends from the neck of the bladder to a point halfway to the meatus, below which point it invests only the anterior half of the canal. This muscle is regarded by the writer quoted as a voluntary sphincter. His observations have not been generally confirmed, although Winckel[1] appears to regard them as reliable. Luschka[2] describes a sphincter muscle common to both the lower end of the urethra and the vaginal orifice. It is a thin muscular band, about six millimeters in breadth, surrounding both the introitus vaginæ and the urethra, and continuous behind with the deep transversus perinei. It serves to compress the urinary canal against the firm urethro-vaginal septum. Another urethral sphincter, known as "Guthrie's muscle," is described by Savage as existing just in front of the sphincter vesicæ, of which it is probably the prolongation.[3] By following the circular layers of smooth muscle throughout their entire course, it will be found that it is incomplete over the lower half of the tube, where the fibres blend with those of the vaginal wall. The longitudinal fibres are continuous above with the inner longitudinal layer of the bladder. The mucous membrane, when in a state of rest, is of a pinkish color, and is thrown into longitudinal folds by reason of the large amount of elastic tissue that is contained within it.

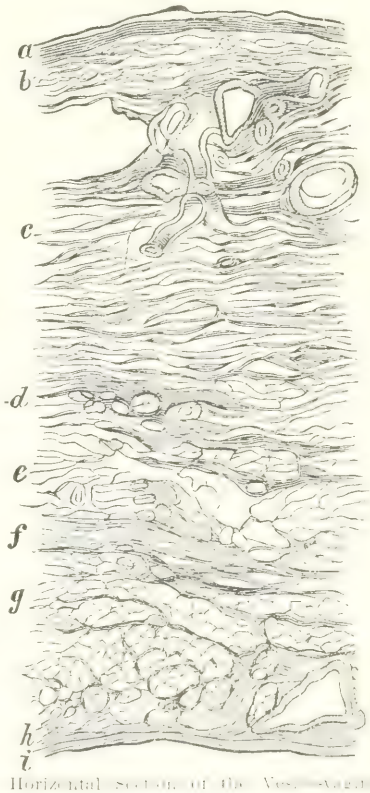
B. *Minute.*—In a cross-section of the urethra the following points are to be noted: Exterior to the canal is a plexus of large veins, which are especially abundant at the sides. These are situated in the midst of a mass of loose cellular tissue, which is seen in its true relation to the urethra within the urethro-vaginal septum, where it appears under the microscope as forming a line of separation between the two portions of the septum. Over the anterior wall of the canal its connection is less intimate. The fibres have both a circular and a longitudinal course. Internal to the cellular layer are the longitudinal muscular fibres, which are recognized by the fact that their spindle-cells are divided longitudinally. Between the two muscular layers, and serving to unite them, is a venous plexus enclosed in loose connective tissue. In the transverse muscular layer the fibres run in several directions, not all of them being disposed in a circular manner, so that the fibre-cells will be divided in different planes. Internal to the muscular coat is a thick submucous layer consisting of fibrous and elastic tissue, and containing a plexus of large veins, some of which are really sinuses; so that this tissue may be regarded as analogous in its character to the corpus cavernosum of the penis. From the submucosa elastic fibres extend into the mucous membrane, and numerous papillæ are formed, as in other mucous tracts, by projections of fibrous tissue from the subjacent layer,

[1] *Op. cit.*, p. 6. [2] *Anat. des Menschl. Beckens.*

[3] See Guthrie, *Anatomy and Diseases of the Genito-urinary Organs.*

which are covered by epithelium and contain loops of capillaries. The mucous lining of the urethra is rich in elastic fibres, and is quite vascular. The epithelium covering its upper portion is of the so-called transitional type, like that of the bladder; that is, it consists of a superficial layer of columnar cells resting upon a layer of cubical epithelium, and this on one of round cells. Near the orifice the cells become squamous, closely resembling those of the vagina, except that they are somewhat smaller. At the meatus they pass into the larger squamous variety. In addition to the papillæ numerous glands are scattered throughout the mucous membrane, as well as lacunæ, the latter being surrounded near the meatus by villous tufts. The glands are lined by columnar epithelium, while the lacunæ have a partial lining of squamous cells near their mouths; the latter become columnar at a short distance from the free surface. Attention should be called to the presence of collections of lymph-corpuscles within the mucous membrane, which give to it in some places almost the appearance of adenoid tissue.[1]

FIG. 60.



Horizontal section of the Vesico-Vaginal Septum (Henle): *a*, vesical epithelium; *b*, submucosa; *c*, layer of circular fibres; *d*, layer of longitudinal fibres; *e*, loose cellular tissue; *f*, layer of circular fibres; *g*, longitudinal layer; *h*, subvaginal tissue; *i*, vaginal epithelium.

A separate description of the minute anatomy of the septum is hardly necessary. The intimate relation between the walls of the two canals can be better appreciated by a study of the accompanying figure than by a detailed statement of the anatomy of the parts, to which reference has already been made.

The vesical opening of the urethra is situated about four-fifths of an inch below, or behind, the middle of the symphysis pubis and an inch and a quarter from the cervix uteri, and will be described in connection with the bladder. Henle states that a cross-section of the canal at this point presents the appearance of a transverse slit, Simon and Winckel claim that it is diagonal, Holden that the opening is infundibular,

[1] Satterthwaite, *op. cit.*, p. 242.

while Savage figures the same as triangular. The determination of this point in the living subject is obviously extremely difficult, if not impossible, and is of no consequence from a practical standpoint. The longitudinal folds in the mucous membrane are especially marked at this extremity of the canal.[1]

Bladder.

Synonyms.—*Gr.*, κύστις; *Lat.*, vesica urinaria; *Fr.*, vessie; *Ger.*, Harnblase; *It.*, vescica; *Sp.*, vejiga.

Definition.—A hollow muscular organ, situated in the anterior part of the pelvis, between the symphysis pubis in front and the vagina and uterus behind.

In the living subject the shape of the bladder is constantly changing as it is filled and emptied, so that it is not easy to state what its normal dimensions are. Its shape and size vary at different ages. In infancy it approaches the masculine type, the vertical diameter being the longer, in the mature female the transverse diameter is the greater, while in the senile state there is a return to the infantile condition. When empty the viscus appears as a collapsed sac, which lies behind the pubes and is partially concealed by the fundus uteri. As it becomes distended with urine it gradually rises from behind the symphysis, appearing as an ovoidal body, that pushes upward the fundus of the uterus and fills the anterior pelvic segment. The usual shape of the empty bladder, as viewed in mesial sections of frozen bodies, is that of the letter Y, the vertical leg of which is formed by the urethra, while the oblique legs may be of equal length, or the posterior one the longer (Hart). Hart and Barbour have also figured a mesial section of the empty bladder in which that viscus is represented as of an oval shape, the latter probably representing the bladder in a condition of systole. In the living subject the contracted organ is more nearly round: this is ascribed by Savage to its inherent tonicity. Except during the act of urination the bladder is flaccid and possesses no definite shape. When moderately distended it becomes round; when fully distended, transversely oval. According to Henle and Luschka, the bladder of the female is smaller than that of the male, though others affirm that it is capable of greater distension. Unlike the male organ, its transverse diameter is larger than the vertical (Fig. 61).

Anatomy.—A. *Gross.*—The bladder is divided into three regions—the body, base or fundus, and neck. The former is defined by Skene as "all that portion of the organ lying above an imaginary line drawn from the ureteric openings to the centre of the symphysis pubis."

[1] For other details *vide* Blum, "Des Affections de l'Urèthre chez la Femme," *Arch. gén. de Méd.*, 1877, vol. ii.

The portion below this plane is the fundus or base, which includes the trigone, or the triangular space between the urethral and ureteric openings, and the bas fond, or part of the fundus behind the openings of the ureters. The latter may even be a deep pouch, especially in old subjects. The thickened portion around the urethral orifice is the neck; it is the most dependent part of the organ when the body is erect.

The boundaries of the different regions are clearly recognized only by examining the interior of the bladder. The most prominent landmark is the vesical orifice, which forms the apex of the trigone, where the mucous membrane is thrown into longitudinal folds. The uvula, a distinct elevation at the apex of the triangle in the male bladder, is only faintly marked in the female. The base of this area is formed by an imaginary line joining the openings of the ureters, which appear as small slits distant from each other and from the urethral orifice about an inch and a half, so that the triangle is equilateral. It is smaller than the corresponding region in the male bladder, and is not so clearly defined.

The bladder is essentially a muscular organ. Its wall, which varies in thickness from one-sixth to one-half an inch, according to the degree of distension (Savage), consists of two layers of muscle with the usual mucous lining. The exterior of the viscus is partially covered by peritoneum, as will be explained subsequently. This muscular coat consists of an outer longitudinal and an inner circular stratum, but a distinct separation of the two is not possible, as the fibres interlace in an intricate manner. The longitudinal fibres (of the unstriped variety), which are beautifully shown when the fully-distended bladder is held before a light, are mostly confined to the anterior and posterior aspects. They may be traced from the vesical neck and pubes in front (where they are called the musculi pubo-vesicales) over the anterior surface of the organ to the summit, whence a few fibres extend over the urachus, and then downward over the posterior to the under surface of the neck, where they blend with the anterior vaginal wall. At the sides this layer is represented by a few pale interlacing fibres (Fig. 61).

The circular fibres are best developed around the vesical orifice, where they form the sphincter vesicæ.[1] Their transverse direction is only maintained in the region of the fundus, especially at the trigone, while above this point they cross one another in an oblique manner. Ellis[2] describes and "figures a submucous stratum," consisting of a thin layer of smooth muscle, the fibres of which run in a longitudinal direction over the lower third of the bladder, and extend for some distance along the urethra. In the upper two-thirds this layer is represented by a few

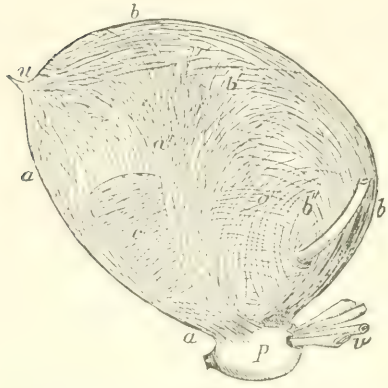
[1] Henle *op. cit.*, denies this function to these fibres.

[2] *Demonstrations of Anatomy*, p. 574.

oblique fibres.[1] Between the muscular and mucous coats there is a layer of fibrous and elastic tissue.

The mucous membrane of the empty bladder is thrown into numerous folds by reason of its loose attachment to the underlying tissue, except at the trigone, where it is thinner than at other points, and is more intimately connected with the submucous layer. Its color has been variously described. As viewed through the endoscope in the living subject, it has always appeared to the writer to present a pinkish or rosy hue. Shortly after death it assumes a slaty color, with here and there pinkish areas due to localized hyperæmia. The mucosa is directly continuous with that lining the urethra and ureters; around the openings of these canals it is more firmly adherent than elsewhere.

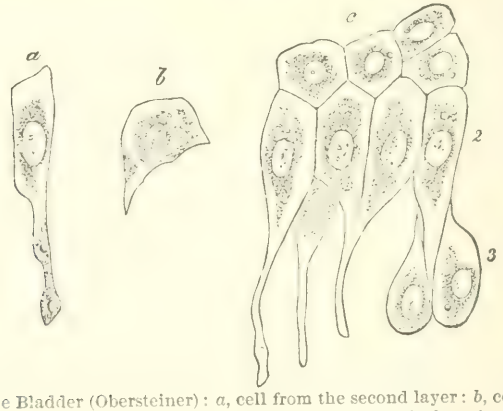
FIG. 61.



Muscular Fibres of the Bladder, lateral view (Allen Thompson): *a*, *a'*, *a''*, decussating longitudinal fibres; *b*, *b'*, diverging fibres; *b''*, divergent fibres surrounding entrance of ureter; *c*, deep layer of circular fibres.

B. *Minute.*—The mucous membrane is the chief object of interest microscopically, the muscular layers presenting the same appearances as in other hollow organs, except that their division into separate strata is less distinct than usual. Klein[2] instances the bladder as an organ in

FIG. 62.



Epithelium of the Bladder (Obersteiner): *a*, cell from the second layer: *b*, cell from the superficial layer; *c*, the three layers as seen in vertical section.

which the bundles of fibres form plexuses. This membrane is supported by the submucous stratum, which is composed of bundles of

[1] For further details *vide Royal Med.-Chir. Transactions* for 1856. [2] *Op. cit.*, p. 64.

fibrous and elastic tissue, in the meshes of which are networks of vessels and a limited number of lymphatics and nerve-plexuses, including ganglia. Nerve-fibres are also visible throughout the muscular coat and just beneath the peritoneum. The epithelial lining of the bladder consists of three or more layers of cells resting upon a membrana propria, and presenting a typical example of the "transitional" type (Fig. 62). The superficial cells are squamous (but smaller than those of the vagina); the inferior layer consists of columnar epithelia with long processes, and the middle of pyriform cells. Over the trigone the mucosa is thinner and more intimately related to the submucous stratum. The mucous membrane contains a rich plexus of fine capillaries and nerve-fibres, the latter being most numerous in the region of the trigone; they have been traced as far as the cells, but the exact manner of their termination is obscure. The lymphatic supply of the tissue is poor. Sections of the vesical wall in the region of the urethral opening show that the mucosa is thicker here than at other points, so that it may form, as Hart and Barbour suggest, the real barrier to the escape of urine. The uvula is formed by a localized thickening of the submucosa. Savage maintained that there are neither villi nor glands in the lining membrane of the bladder. The former are certainly absent, but later investigations have demonstrated beyond a doubt the existence of small lacunæ and racemose mucous glands lined with cylindrical epithelium, the latter being most numerous near the neck of the bladder.

The organ derives its vascular supply from the anterior division of the internal iliac artery, through the medium of the three vesical branches and a branch from the uterine. These vessels anastomose freely.

The arterial supply of the urethra is received from the branches that are distributed to the anterior vaginal wall. The vaginal artery sends a twig to the region around the vesical neck. The venous plexuses are large and intricate; they cover the exterior of the organ lying outside of the muscular coat, and are largest around the base and neck. The latter plexuses communicate with those of the uterus, vagina, nymphæ, and rectum, and empty into the internal iliac vein. The urethra has its own venous plexus, which is intimately related to the vaginal veins.

The lymphatics from the submucous stratum and exterior of the bladder accompany the veins, and finally enter the glands near the internal iliac artery. The nerves belong to both the sympathetic and cerebro-spinal systems, the former being derived from the hypogastric plexus, and supplying the bladder in common with the other pelvic organs. The latter nerves are branches of the third and fourth sacral, and are distributed mainly around the base and neck.

Relations and Attachments.—Anteriorly the bladder is separated from the posterior surface of the symphysis pubis by the retro-

pubic fat, which latter tissue assumes a triangular shape when the viscus is empty. The anterior surface of the organ is entirely devoid of peritoneum; as it rises above the pubes it approaches closely to the anterior abdominal wall. The summit of the bladder and a portion of the posterior wall are covered by peritoneum. The former is only in contact with coils of small intestine when the organ rises out of the pelvis; under normal conditions the vesico-uterine pouch does not contain intestine. As the bladder becomes empty the uterus inclines forward, resting upon—or, more correctly, over—the summit, while the coils of small intestine glide backward. Below the level of the os internum the peritoneal investment of the posterior wall is wanting, and the latter is united to the upper part of the anterior vaginal wall by means of an intervening layer of dense fibrous tissue.

The neck of the bladder and the upper fourth of the urethra have the same attachment to the vaginal wall, the entire thickness of the tissue separating the cavities of the bladder and vagina being known as the vesico-vaginal septum. Above the upper limit of the septum is a subperitoneal space, intervening between the posterior vesical wall and the cervix uteri; this is filled with a small quantity of loose cellular tissue. The round ligaments cross the lateral walls of the bladder, while above and behind the summit are the broad ligaments with their contents.

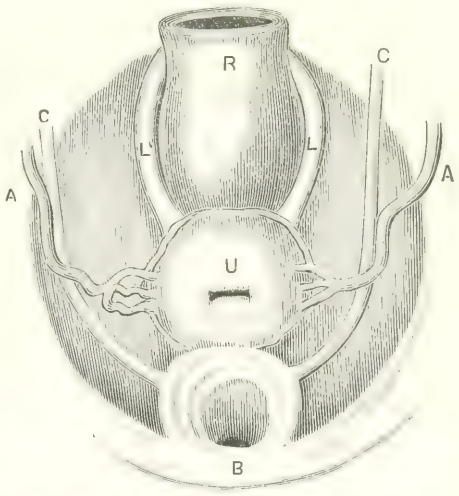
The relations of the ureters will be described later. The so-called true and false ligaments will be mentioned under the sections treating of the pelvic connective tissue and peritoneum, of which they form parts. The attachments of the urachus and obliterated hypogastric arteries are the same as in the male bladder.

Ureters.—Their course previous to entering the pelvis is the same as in the male. Their relations within the pelvis have been studied with great care in connection with the obstetrical operation known as gastro-elytrotomy.[1] In the non-pregnant woman they are nearly parallel in the upper part of their course until they cross the iliac arteries (the left ureter lying behind the sigmoid flexure, the right behind the lower end of the ileum), when they extend downward, backward, and outward along the lateral walls of the pelvis until near the spine of the ischium, where they bend downward, forward, and inward behind the uterine vessels. Passing beneath the bases of the broad ligaments, they converge behind the cervix uteri, and enter the bladder from one-half to three-quarters of an inch in front of, and below, it. The distance between the two ureters just as they reach the bladder is about two inches. They run in the muscular coat of that organ

[1] Garrigues and Polk have investigated this subject quite thoroughly. Comp. Garrigues's papers in *Am. Journ. Obstet.*, Jan., 1883; *N. Y. Med. Journ.*, Oct. and Nov., 1878; and Polk's in the *N. Y. Med. Journ.*, May, 1882, and *Am. Journ. Obstet.*, Jan., 1883.

for a distance of a little more than half an inch, still converging, so that their internal openings are separated from each other by only an inch or an inch and a half, and from the anterior lip of the cervix by a space of three-quarters of an inch. Just before entering the bladder they lie in the mass of cellular tissue which is immediately above the lateral walls of the vagina. As each ureter pierces the muscular coat of the bladder its circular fibres blend with those of the inner or circular layer, while the longitudinal are prolonged inward to meet those of the opposite side, forming the "interureteric ligament" of Juerié, which is represented by a transverse ridge extending between the ureteric openings and constituting the base of the vesical triangle. The slit-like orifices of the ureters are protected by valvular folds of mucous membrane. Two faintly-marked bundles of smooth muscular fibres (rudimentary in the female) have been described as arising from the so-called vesical sphincter, and passing beneath the base, to be attached near the terminations of the ureters. The function of these muscles, as well as of the interureteric band, seems to be to close the orifices of those tubes by drawing upon them, thus preventing regurgitation during the act of urination.

FIG. 63.



Relations of the Ureters at the level of the os internum as seen from above (Polk). *U*, uterus; *B*, bladder; *R*, rectum; *A*, *A*, uterine arteries; *C*, *C*, ureters; *L*, *L*, utero-sacral ligaments.

The relations of the ureters in the pregnant woman are slightly different from those in the non-pregnant, the differences being thus summarized by Polk,[1] who has made a special study of the subject: "As a whole, the tubes in the pelvis are situated upon a higher plane than in the non-pregnant condition, having been carried slightly upward, while being separated from their close relations with the pelvic wall by the ascending uterus."[2] The gross and microscopical anatomy of these canals does not require a separate description.

PRACTICAL DEDUCTIONS.—The condition of the bladder is too often disregarded during an examination of the female pelvic organs,

[1] *N. Y. Med. Journ.*, May, 1882.

[2] See also Luschka, "Topographie d. Harnleiter d. Weibes," *Arch. für Gyn.*, iii. 1872, p. 373.

although the symptoms referable to this organ are among the most common and distressing of which women complain. There is such a radical difference between the urethro-vesical tract in the sexes, as regards both its anatomy and pathology, that the reader should not seek to draw comparisons. To infer that a woman has acute cystitis because she has symptoms ordinarily accompanying that disease in the male would imply a complete ignorance of the anatomy and physics of the pelvis.

Let the reader bear in mind the cardinal fact that "the uterus and bladder behave practically as one organ," so far as concerns changes in position; in other words, that the base of the bladder is so firmly united to the uterus that any displacement of the latter will cause traction upon the former at its point of attachment to the pubes—*i. e.* the neck. Thus is explained the vesical irritation (frequent and painful micturition) so common in acquired anteflexion, where the traction exerted along the line of the utero-sacral ligaments is transmitted from their uterine attachment to the neck of the bladder. In this way a remote retro-uterine inflammation may directly effect the bladder, causing a permanent disturbance of its functions, while the organ itself remains free from disease. This is more in accord with anatomical facts than the theory that frequent micturition in cases of ante-displacement is due to the pressure of the fundus uteri on the bladder. The effects of backward displacement upon the bladder are best observed in retroflexion of the gravid uterus, when the neck of the former organ may be so compressed between the cervix and the pubes that retention and all its serious consequences may result.

Aside from the physiological elevation of the bladder during pregnancy, the organ is sometimes drawn upward by a fibroid uterus, or ovarian cyst, in such a manner that it might easily be wounded by the laparotomist. The introduction of a sound as a guide is the only safeguard. This precaution is indispensable during the separation of the bladder from the uterus in vaginal extirpation, a delicate procedure requiring both time and patience. Perforation of the vesical wall can only be avoided by keeping close to the uterus. The proximity of the bladder to the organs occupying the anterior pelvic fossa has suggested the practice of the vesical touch, in which the finger is introduced through the dilated urethra.

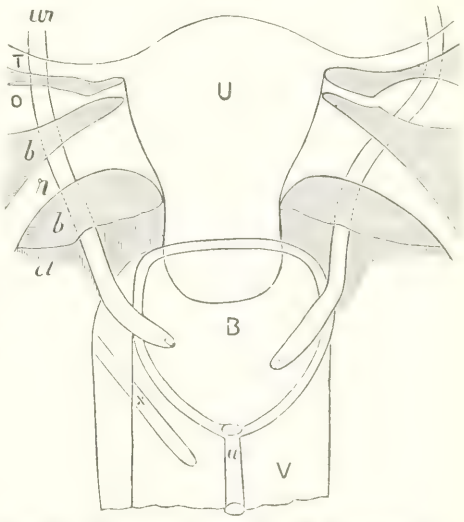
That portion of the posterior wall of the viscus which enters into the formation of the vesico-vaginal septum is most interesting surgically, since it is the usual site of fistula and is the region in which artificial openings are made into the bladder for the removal of calculi, foreign bodies, or morbid growths, the relief of chronic cystitis, etc. This portion of the bladder is, of course, not covered by peritoneum. Cystocele also occurs in this locality from obvious causes. Retention

of urine in the pouch thus formed may lead to cystitis or to the formation of calculi. It will occur to the reader that, by advising a patient to urinate on the hands and knees, gravity will assist in emptying this pouch. There can be no excuse for dragging a large calculus through a dilated urethra, at the risk of causing permanent incontinence, when it can be removed so easily and safely through an incision in the septum. Surgical wounds of the septum heal so rapidly that it is difficult to maintain a permanent opening after cystotomy, unless the opening is made with the thermo-cautery or by Emmet's method.

From what has been said regarding the course of the ureters just before entering the bladder, it will be inferred that transverse incisions through the septum should be avoided, median longitudinal ones being safer. As the mucous membrane of the vagina is loose and movable, we can only avoid making an irregular or valvular opening by cutting down directly upon the end of a sound, which presses forward the septum at the exact point at which it is proposed to establish the fistula. The ureters may be included in a large fistula, and one or both of their openings can be seen in the everted vesical mucosa; it must then be exceedingly difficult to avoid including them in the sutures at the time of operation. Uretero-vaginal fistulæ are rarely formed in the fornix; communications between a ureter and the uterine cavity are still more uncommon.

The operation of catheterization of the ureters possesses no practical interest for the general reader. In complete extirpation of the uterus the operator avoids these ducts by keeping close to the cervix; in gastro-elytrotomy it is generally acknowledged that the vagina should be opened above the line at which it is crossed by the ureter. From the limited space which exists for the incision in the latter operation, it is evident that the tear may readily involve the bladder; which is, in fact, a common accident. Fortunately, wounds of this viscus (especially at its fundus) heal quickly.

FIG. 65.



Surgical Relations of the Ureters (Garrigues): *U*, uterus; *B*, bladder; *ur*, ureter; *u*, urethra; *V*, vagina, with *x*, showing line of incision in gastro-elytrotomy; *T*, Fallopian tube; *O*, ovary; *b*, broad ligament; *r*, round ligament; *cl*, connective tissue.

Since endoscopy has become popular we have been able to study

thoroughly the normal mucous membrane of the bladder, and consequently to distinguish more definitely the changes in its color due to disease. It may be stated in general, with regard to inflammation of the female bladder, that it is capable of being diagnosticated more directly (by palpation through the vagina, etc.), and that local treatment by means of irrigation, permanent catheterization, and surgical interference is more practicable, than in the male. Intractable as are many cases of chronic cystitis, it would seem as if suppuration and renal complications should be of rare occurrence when the gynecologist can at any time establish perfect drainage through an artificial fistula, and thus also apply his remedies directly to the diseased mucosa. Our study of the pelvic nerves has shown us that the innervation of the genital and urinary tracts is practically the same. We have seen that certain affections of the other pelvic organs may cause irritation of the bladder, and conversely. The sphincter vesicæ being especially sensitive to these reflex influences, we need not wonder that incontinence and retention may result from distant causes.

The frequent extension of malignant disease of the cervix to the bladder, and the ultimate uræmic complications which may result, are well known.

The female urethra differs from that of the male in its shortness, its dilatability, and its comparative immobility. The first two peculiarities tempt the gynecologist to enlarge the canal for the convenient practice of manipulations within the bladder, while the last suggests a danger from over-dilatation, which is not imaginary. Although there is a wide difference of opinion as to the liability to persistent incontinence after dilatation of this canal, for the purpose either of introducing the fingers or of extracting a foreign body, a careful study of its anatomy must convince the reader that this procedure is not so harmless as it has been represented. Emmet, in the light of his great clinical experience, strongly condemns it. In some instances clumsy efforts to extract calculi have resulted in laceration of the urethra. Dr. Emmet believes that this laceration is usually transverse, and is situated in front of the subpubic ligament; to repair the injury requires exceptional skill in plastic surgery. Urethrocele is believed by the same writer to be also due to mechanical injury to the canal, whereby its natural supports are weakened. The prolonged compression of the urethral tissues between the pubes and the impacted fetal head is no slight cause of lesions. The most important surgical operation in this region is the formation of a "buttonhole," after Emmet's method.

At the meatus Skene's glands possess a practical interest, from the inflammation to which they are subject; this inflammation, though localized, is very obstinate, and can be cured only by treatment directed to the glands themselves.

We need not dwell upon the little operation of passing the catheter. Easy as it appears from the description, when the bladder is drawn upward, or compressed by morbid growths, or the urethra is encroached upon by a large fœtal head, it often tests both the skill and the anatomical knowledge of the physician. Nothing will be gained by force; the length and direction of the canal must be remembered, and the catheter must be guided accordingly. It would hardly seem necessary to add the caution that the female bladder is peculiarly liable to receive infection from unclean instruments, and that the resulting cystitis is often extremely intractable.

Rectum.

Synonyms.—*Lat.*, rectum; *Fr.*, rectum; *Ger.*, Mastdarm; *It.*, retto; *Sp.*, recto.

Definition.—The rectum is the lower extremity of the large intestine and the termination of the intestinal tract.

The rectum of the female, although it is not so intimately connected with the genital organs as the urinary tract, and is not the seat of as many affections which directly concern the gynecologist, nevertheless deserves careful mention because of the relation which it bears to the pelvic contents. It is not enough for the specialist and general practitioner to become thoroughly acquainted with these relations from an anatomical standpoint; he must also be familiar with the "feel" of those organs which can be touched through the anterior rectal wall.

The rectum begins near the left sacro-iliac synchrondrosis, extends downward and backward, and at the same time toward the median line of the body, until it reaches a point opposite to the third sacral vertebra, when it curves downward and forward behind the cervix uteri to meet the vagina, the course of which canal it follows, finally making a sharp bend backward to its termination. It thus appears that the rectum presents three separate curves, the first being from left to right, the second forward, and the third directly backward.[1]

The reader must be cautioned against regarding the rectum as an open canal, as it is figured in many textbooks. A careful study of frozen sections, as well as observations made on the living subject, prove that, unless distended by the presence of some foreign body, it is, like the canals of the genito-urinary system, simply a slit, and, moreover, that during life the anus is never patent under normal conditions, except when by the relaxation of the sphincter it opens to allow the passage of feces.

[1] The direction of the anal canal is thus given by Hart and Barbour *loc. cit.*, who base their statement upon studies of frozen sections. The writer is inclined to believe, with Ranney, that this direction is more nearly vertical.

Anatomy.—A. *Gross.*—The rectum in the female is about eight inches in length, and is somewhat less curved than in the male, its calibre being usually greater. Externally it is smooth, non-sacculated, and is destitute of the longitudinal muscular bands which are the prominent characteristics of the colon. Although the lower four inches of the canal are usually empty, the portion just above the anus is capable of great distension, and has in consequence been called the "ampulla." When hyper-distended by artificial means the rectum appears to taper gradually from the ampulla to the upper end, which is the narrowest part next to the anus[1] (Fig. 65).

Fig. 65.

Rectum Inflated (Chadwick): *a, b,* sphincter tertius; *c,* ampulla.

The anal orifice is very dilatable; the anus itself is not a mere aperture, but a canal, extending through the entire thickness of the integument and muscles forming the pelvic floor. The skin around the external opening is thrown into a number of radiating folds, caused by the contraction of the sphincter, is deeply pigmented, and is covered with hair and sebaceous glands.

On exposing the interior of the rectum by an incision carried through the entire length of the anterior wall, a number of folds will be observed in the mucous lining. Those near the anus have mostly a longitudinal direction, and are known as the "columns of Morgagni," the depressions between them being called the "sinuses of Morgagni;" they are said to be corrugations of the mucous membrane due to the contraction of the sphincter, and they nearly all disappear when the gut is distended. Higher up in the bowel are various circular and oblique folds. Three of the latter variety are permanent; they include a portion of the muscular as well as the mucous stratum, and are about half an inch in depth. One of these projects from the anterior wall at a distance of an inch and a half from the anus,[2] another is on the right side of the canal, on a level with the sacral promontory, while a third is situated midway between the two on the left side.

The lowest fold has been called "the valve of Houston," while Hyrtl has described it under the name of sphincter ani tertius. The so-called

[1] *Vide* Chadwick, "The Function of the Anal Sphincters," *Trans. Am. Gyn. Soc.*, vol. ii. p. 43.

[2] Ellis (*op. cit.*, p. 583) says that it is "three inches from the anus, on the front of the rectum, opposite the base of the bladder."

"third sphincter of the rectum" is a structure which has received no small amount of attention—more, in fact, than it quite deserves. There has been much controversy regarding its location, appearance, and function. All authorities agree that folds and constrictions do exist within the rectum, but they differ widely as to the number of folds and the exact situation of those which form the third sphincter. Chadwick[1] describes and figures it as consisting of two crescentic rugæ, one of which is in the anterior wall (corresponding with the lowest valve of Houston), while the other is an inch higher up in the posterior wall. The writer has seen the upper fold so prominent that it was mistaken for a stricture. On the other hand, he has met with folds in the mucous membrane at a distance of three or four inches from the anus so large that they arrested a rectal tube, but when the patient was examined under ether, the canal being exposed with a Sims speculum, they had entirely disappeared.[2] An extended discussion of this matter would be out of place here. It is enough to state that the sphincter in question is not, as its name suggests, a band encircling the gut, but a succession of valve-like folds situated at different levels and acting together to cause a certain amount of constriction of the canal.

The coats of the rectum are three in number. Like the bladder, it has only a partial peritoneal investment, the disposition of which will be mentioned subsequently. The muscular coat includes two layers of unstriped muscle—a superficial, which consists of longitudinal fibres similar to those in the colon, but distributed uniformly around the gut instead of being collected in separate bands, and a deep layer of circular fibres. The latter are best marked immediately above the anus, where they form a distinct ring nearly half an inch in width (internal sphincter). The submucous layer is common to the intestine. The mucous lining is thicker and more movable than that of the colon, and, by reason of its vascularity, generally appears of a bright pink, or even red, color.

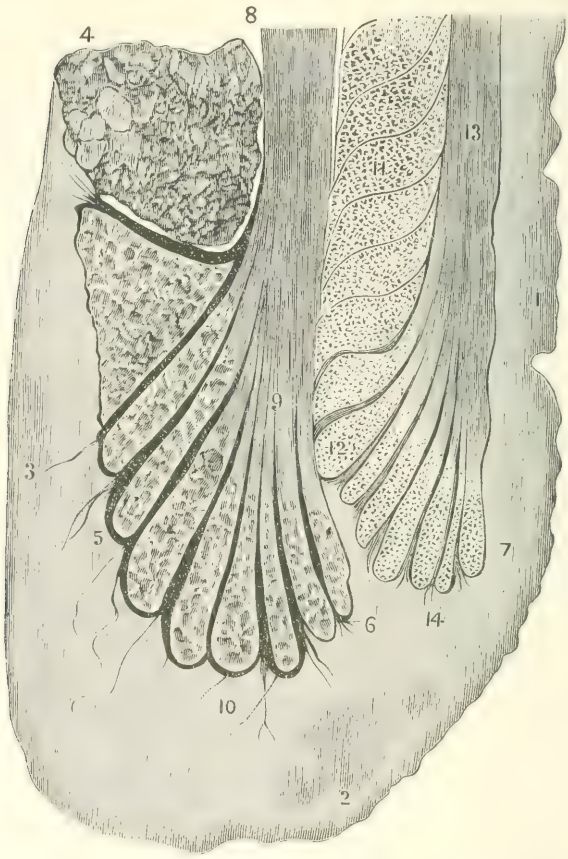
Certain muscles are attached to the lower end of the rectum. Of these the levatores ani are especially important, as forming an essential part of the pelvic floor; they will be described in connection with that structure. The external sphincter is a thin, pale, elliptical voluntary muscle which surrounds the anal canal, having posteriorly a fibrous attachment to the coccyx, while anteriorly it is inserted into the perineal centre, where it appears to blend with the sphincter vaginæ. Dr. Emmet has recently stated that the opposite fibres of the sphincter do *not* interlace in front of the anus, but run parallel to each other up to their point of insertion, being simply kept in apposition by transverse

[1] *Op. cit.*

[2] For an able article on this subject by Kelsey the reader is referred to the *N. Y. Med. Journal* for March, 1881.

bands of fibrous tissue.[1] Although this opinion seems to be supported by many of the figures in anatomical works, the writer has not been able to satisfy himself by his own dissections of its absolute correctness. The relations of the sphincter to the perineal body belong properly to the section which treats of that subject. Ellis also describes a delicate

FIG. 66.



Vertical Section through Lower End of Rectum (Ruedinger): 1, rectal mucous membrane; 2, line of separation between mucous membrane and skin of buttock; 3, fat; 4, levator ani; 5, 6, external sphincter; 7, internal sphincter; 8, 9, longitudinal muscular fibres interlacing with those of sphincter; 10, terminations of longitudinal fibres; 11, circular fibres; 12, 13, longitudinal fibres of muscularis mucosæ.

subcutaneous layer of involuntary muscle that "surrounds the anus with radiating fibres" (corrugator cutis ani).

B. *Minute.*—The muscular coat offers nothing of particular interest microscopically, except near the anus, where the longitudinal fibres

[1] A laceration of the perineum through the sphincter involves, according to some writers, simply a separation of the opposite halves of the muscle, and not an actual laceration of its fibres.

interlace with those of the sphincters and end just beneath the integument of the anal region.

The minute anatomy of the mucous membrane is similar to that of the colon. It is lined by columnar epithelium and contains numbers of Lieberkühn's follicles. Hermann and Desfosses have described convoluted glands which open on the free surface near the anus.[1] There is a transition at the anus from columnar to stratified pavement epithelium. The so-called "white line" marks the lower limit of the mucous membrane.

The vascular supply of the rectum is very abundant. The branches of the three hemorrhoidal arteries (of which the superior arises from the inferior mesenteric, the middle generally from the internal iliac, and the inferior from the pudic) penetrate the muscular coat in the upper half of the canal, and form a network in the submucous layer; over the lower half they run downward parallel to one another, and to the long axis of the bowel, as far as the anus, where they are united by transverse branches.[2] The veins form a dense plexus (hemorrhoidal plexus) in the submucosa, which communicates with another plexus exterior to the gut, and empties into those veins that accompany the corresponding arteries. These enter both the portal and general venous systems, the superior hemorrhoidal being a branch of the inferior mesenteric vein, while the middle and inferior hemorrhoidal veins empty into the internal iliac. The lymphatics form two intercommunicating plexuses, one in the submucosa, and the other beneath the peritoneum and in the superficial muscular stratum. In the anal region they communicate with those of the integument. They all pass through the glands of the mesorectum to terminate in the sacral glands. The sympathetic nerves are derived mostly from the hypogastric plexuses, those of the cerebro-spinal system from the sacral plexus.

Relations and Attachments.—The upper portion of the rectum, which is covered by peritoneum, is in direct relation anteriorly with the pouch of Douglas; the utero-sacral folds, that form the lateral boundaries of the pouch, pass on each side of the rectum to reach the sacrum. When the bladder is empty and the uterus inclines forward, the anterior rectal wall will be in contact with the loops of small intestine which fill the fossa. As the uterus rises toward the vertical the small intestine is displaced upward, and the rectum and uterus are only separated by a narrow space, in which is a double fold of peritoneum. If the rectum is much distended, or the uterus has a considerable range of mobility, the two may be in contact, especially when the woman is in the recumbent posture. On the left side of this portion of the rectum lie the ureter and some branches of the internal iliac artery. Behind it is a fold of peritoneum (mesorectum) which attaches it to the sacrum.

[1] *Compt. rend.*, xc., 1880. [2] Quain's *Anatomy*, 9th ed., vol. ii. p. 619.

against which bone it lies; it rests also upon the left pyriformis muscle and sacral plexus.

The sacral portion of the rectum, or that part which lies within the hollow of the sacrum, gradually loses its peritoneal covering, first behind, then at the sides, and finally in front. It is in relation anteriorly at first with the bottom of Douglas's pouch, which intervenes between it and the upper end of the posterior vaginal wall; but at a point about three inches from the ostium the peritoneum is reflected from the rectum, and the latter becomes loosely attached to the vagina as low as an inch and a half from the anus. Here the rectum bends backward and the vagina somewhat forward, so that a triangular interval is left between the lower extremities of the two canals, which is occupied by the perineal body. The septum separating the rectum and vagina where they lie in contact (recto-vaginal septum) is formed by their walls and a quantity of loose areolar tissue enclosing some venous plexuses that serves to connect them. The rectum is attached to the sacrum and coccyx by bands of fibrous tissue containing a quantity of fat. Laterally, it receives the insertions of the levatores ani. The anal canal is in immediate relation anteriorly with the base of the perineal body, and is surrounded above by the external sphincter, and at its termination by integument, beneath which is a layer of adipose tissue.

Practical Deductions.—The principal point of practical interest in the rectum of the female is its relation to the genital organs. By the rectal touch we are enabled to distinguish, more clearly than by the vaginal, retro-uterine tumors, inflammatory conditions of the utero-sacral ligaments, etc. Prolapsed tubes and ovaries and indurations in the broad ligaments can also be touched through the rectal wall. It is often possible to replace a retroverted uterus (and especially the retro-displaced pregnant organ) by pressure exerted through the rectum.

That gynecologists emphasize the fact that habitual constipation is a fruitful source and aggravation of uterine disease, especially of displacements, cannot surprise the reader who considers the relations of the rectum to the genital tract, and the changes in size and position of the latter which result from constant over-distension of the gut. The pain occasioned by the pressure of hardened feces against a sensitive ovary or an acute inflammatory focus can readily be conceived. Rectocele as a result of fecal accumulation is easily understood. The rectum is closely connected with the vagina, so that the two canals share some affections in common; in fact, disease of the former is sometimes referred by the patient to the latter. Thus rectocele is not, as its name would seem to imply, a prolapse of the rectum alone, but of the anterior rectal and posterior vaginal walls, which have been deprived of their natural support by a tear of the perineal body (and injury to the

pelvic floor?). A minute recto-vaginal fistula may cause an amount of discomfort to the patient entirely out of proportion to its size.

On account of its proximity to the vagina, the lower end of the rectum can readily be examined by introducing one or two fingers into the former canal and everting the rectal mucous membrane through the sphincter. The lower third of the recto-vaginal septum generally shares in laceration of the perineum extending through the sphincter; the hemorrhage at the time of the accident, when the circulation has been obstructed by prolonged pressure of the child's head, is sometimes quite alarming. The reader need only recall the train of consequences which ultimately follows this lesion in order to recognize the propriety of the primary operation for its repair, although it is not always successful. The secondary operation for laceration through the sphincter requires as much skill and judgment as any in gynecology; the difficulty of maintaining perfect apposition of the parts and rest during healing is obvious. From the anatomical structure of the torn sphincter and its constant tendency to contract, it often fails to unite perfectly. The method of closing the tear in the recto-vaginal septum by suturing the rectal and vaginal mucosa separately, and then repairing the perineal rupture, including the sphincter, seems to provide against most of the chances of failure.

Constipation not only favors the development and persistence of uterine disease, but it renders common certain affections that result from obstruction to the venous circulation, especially hemorrhoids. It is in vain to treat these latter until the cause has been sought for and removed. Referring again to the oft-mentioned continuity of the pelvic venous plexuses, the writer need only call attention to the fact that the obstruction of the circulation through the rectal vessels may be situated in some remote portion of the pelvis. If ablation is necessary, the operation is easier than in the male, since the piles are rendered easily accessible by everting them by pressure through the vagina.

The reflex symptoms resulting from rectal disease in the female are best observed in cases of anal fissure. Besides the characteristic pain experienced after defecation, the patient may suffer from vaginismus or vesical disturbance, or may describe symptoms which point to some affections of the internal genital organs. Thorough dilatation of the sphincter will remove a train of evils which appeared as formidable as they were inexplicable. From the close proximity of the anus to the vulva, it follows that certain affections of the latter may readily extend to the former. Thus, pruritus ani, although it may exist independently, often accompanies pruritus vulvæ, while acrid and irritating vaginal discharges, specific or non-specific, flowing downward over the anus while the patient lies upon the back, may cause troubles which are

rarely found in that region in the male (chancroids, *plaques*, muquenses, etc.).

Pelvic abscesses sometimes rupture into the lower bowel, and continue to discharge their contents for months, or even years, especially during defecation. It is manifest that it is not only next to impossible to discover the opening of such an abscess, but to promote healing of the sac, since it is subject to constant disturbance from the passage of the feces. This fact is sufficient to prevent the surgeon from tapping an abscess, ovarian cyst, or hæmatocele through the rectal wall, or from removing a diseased ovary through this channel, the latter being an operation that has never enjoyed much favor.

In addition to the organs contained within the female pelvis, there are certain tissues that invest and support those organs, with the anatomy and relations of which it is important for the gynecologist to be thoroughly acquainted. These are arranged to some extent in layers, and include, as viewed from above downward, the peritoneum, the connective tissue, and the pelvic floor. Each of these will be studied first as a whole, and then in its relations to individual organs. It is assumed that the reader is sufficiently familiar with the bony pelvis through his obstetrical reading to obviate the necessity of introducing even a brief description of it here.

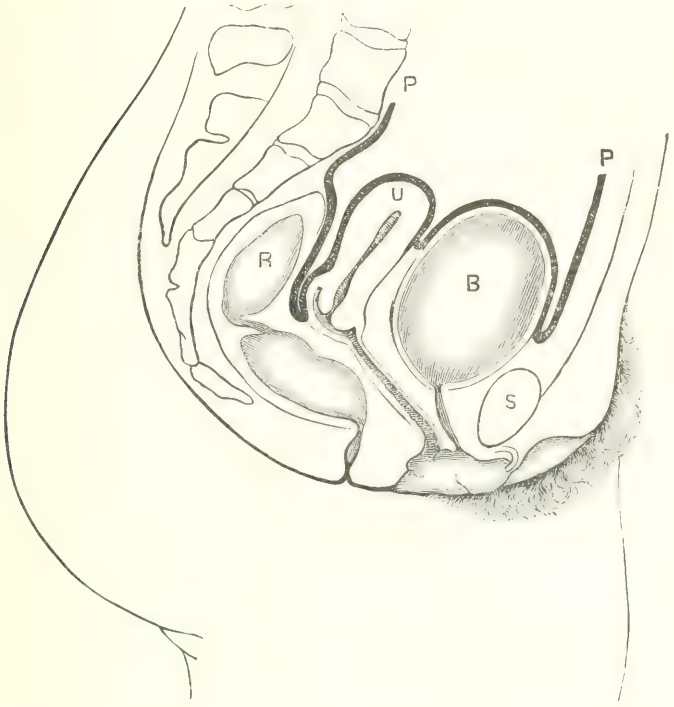
Pelvic Peritoneum.

As its name implies, this includes that portion of the serous lining of the abdomen which covers the floor of the pelvis and invests more or less completely the contained organs. The peritoneum covering the anterior abdominal wall, as traced in a vertical mesial section at a point an inch or an inch and a half above the upper border of the symphysis pubis, is reflected backward to the fundus of the bladder. Covering the posterior surface of that viscus as low as the level of the internal os (and as much of the lateral surfaces as lies behind the obliterated hypogastric arteries), it crosses over to the anterior surface of the uterus, which it invests, while laterally it extends outward in a plane perpendicular to that of the pelvic brim, to be attached to the lateral wall of the cavity, forming the anterior fold of the broad ligament: having covered the fundus uteri, it descends on the posterior surface of the organ to a point on the vaginal wall about an inch below the utero-vaginal junction, at the same time extending laterally as the posterior lamina of the broad ligament. Finally, it is reflected from the vagina to the anterior surface of the second portion of the rectum, and ascends to the third part, which it surrounds completely (Fig. 67). Above this point it leaves the pelvis, and need not be traced farther.

Besides investing the organs in the manner described, the membrane

lines the lateral walls of the pelvis and dips down to cover the pelvic floor, forming the anterior and posterior fossæ, which are separated by the broad ligaments. The anterior is not so deep as the posterior, since the peritoneum at the sides of the bladder only descends as low as the base of the broad ligament, while behind the uterus it forms the pouch

FIG. 67.



Diagrammatic Representation of the Pelvic Peritoneum, as seen in a mesial section (Ranney): *P, P*, peritoneum; *R*, rectum; *U*, uterus; *B*, bladder, distended; *S*, symphysis pubis.

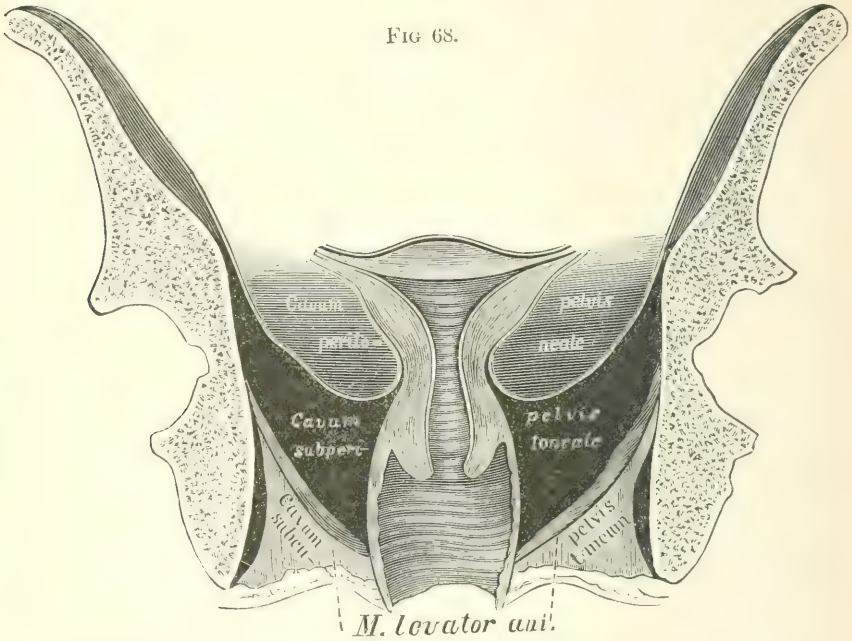
of Douglas, the bottom of which is considerably below this level. Following Luschka's teaching, we may regard the peritoneum as a sort of diaphragm dividing the pelvic cavity into two portions: the one above the peritoneum may be called the peritoneal space, while that which is situated below it (*i. e.* between the peritoneum and the upper surface of the levator ani muscle) is the subperitoneal. The latter contains most of the connective tissue of the pelvis (Fig. 68).

From what has already been said, it will be inferred that portions of the pelvic organs are devoid of a peritoneal investment; all of the organs are really situated in the "cavum pelvis subperitoneale," although the anterior surface of the bladder, the anterior aspect of the cervix, the anterior fornix vaginæ, and the lower two-thirds of the rectum are

the uncovered portions that lie in this space. The peritoneum is capable of a considerable amount of distension, so as to accommodate itself to the variable size and position of each organ to which it is attached. Thus it is affirmed by some writers that the lining of the anterior abdominal wall immediately above the symphysis is actually "stripped off" by the bladder as it rises in extreme distension. Less probable is the theory of Josephs, that, as the viscus fills, it deprives the anterior surface of the uterus of a portion of its serous covering.[1]

Polk has studied the changes in the relative position of the pelvic peritoneum occasioned by pregnancy.[2] The principal alteration seems to consist in the elevation of the broad ligaments above the level which

FIG 68.



Cross-section of the Pelvis, showing the Peritoneal and Subperitoneal Cavities (Luschka).

they occupy in the nulliparous woman. Hart and Barbour, reasoning from the appearances seen in frozen sections, maintain that "during parturition the peritoneum is drawn off from the bladder." Savage is sceptical on this point. Without stopping to discuss a matter which is still *sub judice*, it may at least be said that the attachment of the serous membrane to the lower part of the anterior abdominal wall and to the fundus and posterior surface of the bladder is less inti-

[1] "Beitrag zur Ätiologie der Uterus-flexionen auf Grund anatomischer Untersuchung. u. Klin. Beobachtung," *Beitrag zur Geburtsh. und Gynäkologie*, Bd. ii., 1879.

[2] "Observations upon the Anatomy of the Female Pelvis," *N. Y. Med. Journ.*, Dec., 1882.

mate than elsewhere, so that if a separation or stripping off occurred it would doubtless be at these points. That the uterus is ever deprived of its peritoneal covering is improbable.

The various attachments and folds of the pelvic peritoneum have been described separately under the name of "ligaments" and "pouches." The former term is not a happy one, since the delicate membrane in question seldom if ever has a true ligamentous function, this being assumed by the subperitoneal layer of fibro-muscular tissue which Savage has described as a platysma muscle. The expression "false ligaments," commonly employed by anatomists in describing the pelvic organs, is in itself an evidence that the peritoneum is not regarded as affording much support to the structures beneath it.

Beginning anteriorly as before, we notice in the median line a narrow fold of peritoneum which extends from the umbilicus along the anterior abdominal wall, and is then reflected along the urachus to the fundus of the bladder. This is known as the ligamentum suspensorium, or superior false ligament. The folds which extend outward from the sides of the organ constitute the lateral false ligaments. The utero-vesical ligament (or ligaments) includes that portion of the membrane which stretches between the uterus and bladder.

The broad ligaments are the double folds of peritoneum before mentioned, which extend from the sides of the uterus to the lateral walls of the pelvis, dividing that cavity into two parts. They contain the uterine appendages with their vessels and nerves, the vessels and nerves of the uterus, and other important structures, all of which have been described. In order to gain an intelligent idea of the formation and contents of the broad ligaments, the reader should forget for a time the unfortunate term "ligament," and recall the appearance of the mesentery with its two laminæ, between which are the vessels and nerves. The conditions are similar: let the Fallopian tube represent a loop of small intestine, and the corresponding broad ligament will be its mesentery. Again: imagine that there is a double layer of membrane stretching across the pelvis, and that the uterus has pushed its way up from beneath and separated the laminæ, which are elsewhere closely approximated. And when we remember that each layer of peritoneum, as it becomes folded, carries with it its subperitoneal layer of fibro-muscular tissue, the subject becomes greatly simplified. It is now easy to understand that there must be a space between the laminæ in which run the vessels and nerves, so that these are subperitoneal as well as the organs which they supply. When the bladder is empty and the uterus is inclined forward, the broad ligaments run outward and backward, while their planes are tipped in such a manner that their anterior surfaces look downward and forward. The base of each ligament will be represented approximately by a wavy line, convex over its external half, drawn

from the lateral border of the uterus at the level of the os internum outward to a point just in front of the sacro-iliac synchrondrosis (Fig. 69).

Its upper margin, corresponding with that of the tube, is slightly concave near the uterus, from the superior angle of which it extends to "a point on the pectineal line, situated in the virgin about midway between the sacro-iliac synchondrosis and the ilio-pectineal eminence." Its inner attachment is along the lateral border of the uterus from the superior angle almost to the lateral fornix of the vagina, from which it is separated by a quantity of loose connective tissue enclosing a venous plexus. The outer edge of the ligament is attached to the pelvic wall "along a line which is situated between the great sacro-

FIG. 69.

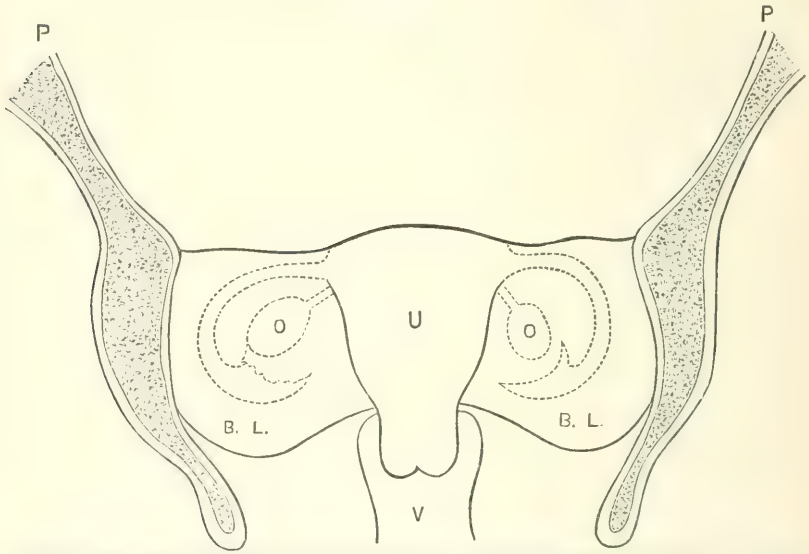


Diagram showing the Attachments and Relations of the Broad Ligaments (Ranney): *P, P,* pelvic bones; *U,* uterus; *V,* vagina; *O,* ovary; *F,* Fallopian tube; *B. L,* broad ligaments.

sciatic notch and the margin of the obturator foramen, as far down as the level of the ischial spine." According to Polk, as the uterus enlarges during pregnancy the bases of the broad ligaments are carried upward until at term they are almost on a level with the pectineal line; their upper borders are simultaneously moved backward. They return to their former positions after delivery.

The following objects are suspended within the folds of the ligaments: Along the upper margins are the Fallopian tubes, enclosed between the two folds which are attached around their distal extremites, where the serous passes into the mucous membrane. The strip of peritoneum between the tube and the ovary is the mesosalpinx. As the fimbriated extremities do not reach the pelvic walls, the gaps are filled

by the so-called infundibulo-pelvic ligaments, which are simply the distal portions of the upper margins of the broad ligaments. Below the proximal ends of the tubes are the ovarian ligaments, at the outer ends of which are the ovaries. These organs are included between the two layers, but are attached to the anterior and project through the posterior.[1] The term mesovarium is sometimes applied to a portion of the broad ligament just below the attached border of the ovary. A space between the folds of the mesosalpinx, between the distal end of

FIG. 70.

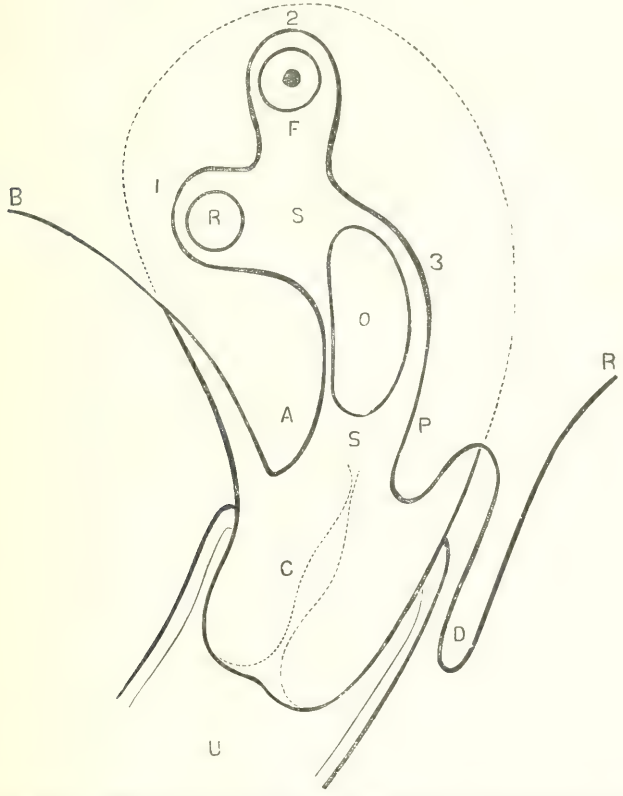


Diagram showing the Three Minor Folds of the Broad Ligament (Ranney): 1, 2, 3, anterior, middle, and posterior folds; *R*, round ligament; *F*, Fallopian tube; *O*, ovary; *V*, vagina; *D*, pouch of Douglas; *A*, anterior layer of broad ligament; *P*, posterior layer; *B*, reflection of peritoneum to bladder; *R*, reflection to rectum; *S*, space containing muscular and connective tissue, enclosing vessels and nerves.

the ovary and the infundibulum, is called by Olshausen[2] the bursa ovarica. In the mesosalpinx below the middle portion of the tube is the parovarium. The round ligaments are still lower down, more

[1] Reference has already been made to the assertion of some writers that there is no peritoneum on the posterior surface of the ovary.

[2] *Krankheiten der Ovarien*, Stuttgart, 1877, p. 7.

internal than the ovaries, and lie in a plane more anterior than the organs already mentioned; the view that the ovary is situated in a separate posterior fold of the broad ligament, the tube in a middle fold, and the round ligament in an anterior, introduces, in the writer's opinion, an unnecessary complication (Fig. 70).

In the space bounded above by the tube and below by the round ligament are the ovarian artery with its branches, the pampiniform plexus, and a dense network of nerves and lymphatics; below this region is one quite free from large vessels. Near the base of the ligament are the uterine artery and venous plexus, and nerves and lymphatics as above. The position of the ureters with reference to the broad ligaments has been made the subject of much discussion, Savage affirming that they are normally found between the laminæ, which is denied by Garrigues. As Polk has shown, in nulliparæ they extend downward along the lateral walls of the pelvis, passing behind the posterior layers of the ligaments at their points of attachment, and dipping down beneath the bases of the same; during pregnancy the ligaments may change their positions and their folds become expanded, while the ureters are but little disturbed, so that the latter may come to be included within them.[1]

After covering the posterior surface of the uterus, the peritoneum dips downward to cover the posterior vaginal fornix and a small portion of the upper extremity of the posterior wall, and then it ascends to the rectum. Two folds, however, cross over directly from the uterus, extending backward and outward in the shape of a letter V, surround the middle part of the rectum, and are attached to the second sacral vertebra.[2] These are known as the utero-sacral ligaments, or folds of Douglas, and from their structure as well as their function they approach more nearly to the character of true ligaments than do any of the peritoneal processes thus far mentioned. They contain a considerable amount of fibrous and smooth muscular tissue, so that they possess a firm, cord-like feel. They may be described as fibro-muscular bands enveloped by peritoneum.

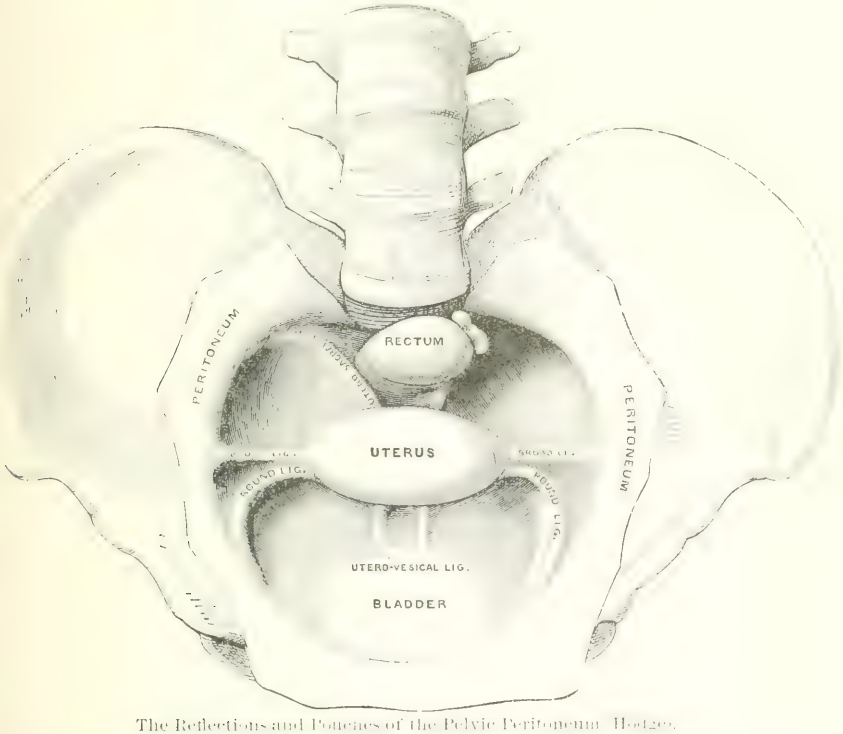
Several well-marked pouches exist in the pelvic peritoneum. The most important of these, as noted in order from before backward, are the pubo-vesical, vesico-abdominal, utero-vesical, and the recto-uterine, or pouch of Douglas. When the empty bladder is in systole the peri-

[1] A consideration of the supporting function of the broad ligaments belongs properly to the article on Displacements. The writer does not believe that they offer much resistance to either antero-posterior displacements or prolapsus of the uterus. When normal, they doubtless oppose to some degree lateral dislocation, just as they may cause lateroflexion when contracted.

[2] We have Polk's statement to the effect that during gestation the utero-sacral ligaments are elevated *en masse*—not only their uterine origins, but also their points of attachment to the bony pelvis, so that they meet the sacrum near the promontory.

toneum appears to be reflected directly from the anterior abdominal wall to the uterus, while a depression exists over the site of the bladder which has been called the utero-abdominal pouch. This cavity, when it exists, is filled with coils of small intestine, which are gradually displaced

FIG. 71.



The Reflections and Fossæ of the Pelvic Peritoneum. Hodge.

upward as the bladder becomes distended. The vesico-abdominal pouch is only observed during distension of the bladder; its depth varies according to the point at which the serous lining of the abdominal wall is reflected. It is always empty. The vesico-uterine pouch is bounded in front by the posterior surface of the bladder, and behind by the anterior surface of the corpus uteri. The actual depth of this fossa varies less than that of the others, because of the firm attachment of the peritoneum to the uterus. When the bladder is empty the bottom of this pouch is separated by about an inch from the anterior cul-de-sac of the vagina; the entire pouch rises somewhat as the bladder fills. (See Fig. 71).

The pouch of Douglas is the most important, as well as the largest, of the serous culs-de-sac of the pelvis. Its shape and extent are not constant. It is bounded in front by the posterior vaginal wall to the extent of an inch, and by the posterior surface of the supra-

vaginal portion of the cervix, behind by the anterior surface of the middle third of the rectum, and laterally by the utero-sacral folds. In spite of opposing statements, the writer has satisfied himself by repeated observations in both dead and living subjects that Hart and Barbour are correct in asserting that, "*when the bladder is empty and the unimpregnated uterus to the front, there is small intestine in Douglas's pouch, except at its very lowest part.*" The normal depth of the pouch, as well as its precise relation to the posterior cul-de-sac, has been variously estimated. The variations in depth may range between twelve millimeters and three centimeters. The bottom of the pouch (which is the lowest limit of the pelvic peritoneum) may encroach so far upon the space between the rectum and vagina as to reach the apex of the perineal body.[1]

Other pouches of less importance might be mentioned. A depression on each side of the bladder is called the paravesical pouch; these pouches may contain loops of small intestine when the bladder is emptied and the uterus lies well forward. The external and internal inguinal pouches, which lie one on each side of the obliterated hypogastric artery, are more properly described in connection with the surgical anatomy of inguinal hernia. The reflection of the peritoneum along the round ligament to form the canal of Nuck has been alluded to in the section on the round ligaments.

Besides the disposition of the pelvic peritoneum in the form of small pouches, we may regard the cavity as divided into two fossæ—an anterior, lying in front of the uterus and broad ligaments, and a posterior, which is situated behind them. From what has already been said, it will be remarked that the peritoneum covering the anterior fossa is not so firmly attached as that in the posterior: this fact is interesting in connection with the theory of the pelvic segments, as will be shown subsequently. The posterior fossa has been further subdivided by Polk into two portions—an upper, which lies above the level of the utero-sacral ligaments, and includes two triangular surfaces called by him the "retro-ovarian shelves,"[2] and a lower, which is Douglas's pouch. The boundaries of each shelf are: in front, the base of the corresponding broad ligament, internally, the utero-sacral ligament of the same side, and externally, the wall of the pelvis. The upper portion of the posterior fossa communicates with the lower through the space which exists between the utero-sacral ligaments. In nulliparæ the most dependent point in the peritoneal lining of the pelvis (excepting, of course, the bottom of Douglas's pouch) nearly always lies above a horizontal plane intersecting the middle of

[1] Pirogoff figures a section of a pelvis in which it descends as low as the ostium vaginæ.

[2] So named because the prolapsed ovaries frequently rest upon them.

the symphysis in front and the point of the union of the third and fourth sacral vertebræ behind. In the pregnant woman, however, the floors of both fossæ are raised (the posterior most noticeably), until at the seventh month the retro-ovarian shelves occupy a higher level than the pelvic brim, while at the same time the posterior fossa is contracted by reason of the change in the external attachments of the broad ligaments. Even Douglas's pouch is slightly elevated above its ordinary level (Polk). The changes in the anterior fossa are less striking.

Practical Deductions.—The peritoneum possesses a peculiar interest for the gynecologist, because it not only clothes the pelvic organs, but from its sensitiveness to irritation receives and transmits inflammations from them. Fatal peritonitis has ceased to be regarded as the natural consequence of injury to the serous lining of the pelvis, but localized inflammation is sufficiently common and deplorable in its ultimate consequences. These limited inflammatory foci are most common in two localities, and for different reasons—around the distal extremities of the tubes and ovaries, through the direct extension of inflammation of the lining of the genital tract, and along the bases of the broad ligaments, as the concomitant (or result) of so-called cellulitis. Remembering how the coils of small intestine descend into the pelvis, so that their serous covering is in direct contact with that of the pelvic cavity, it is evident that a peritonitis may remain strictly localized, and yet may result in the formation of adhesions which will impair the functions of several organs. When the laparotomist boasts at the present day that peritonitis is a rare complication, he refers to a general affection of the serous membrane. Some organs are only loosely covered by peritoneum; to others it is closely adherent. This distinction is not unimportant, since injury to the serous coat of the uterus, for example, is a more serious matter than if a tear in the peritoneal covering of the bladder is involved, both as regards hemorrhage and subsequent inflammation.

It is desirable that the reader should rid his mind of the idea that the so-called broad ligaments are "ligaments" in the sense that they furnish much support to the uterus: they rather serve to steady it and oppose lateral deviation of the organ. Doubtless their most important function is to suspend the uterine appendages and to support the network of vessels that ramify between its folds. Cicatrices in either ligament produce lateroflexion, a form of displacement exceedingly resistant to treatment. Tearing of the folds—an accident which is not uncommon in separating adhesions during laparotomy or as a result of too great traction upon the pedicle of an ovarian or tubal tumor—is followed by an obstinate hemorrhage, which it is difficult to control because of the situation of the bleeding points at the bottom of the pelvis. Temporary compression by means of long forceps, or pres-

sure exerted through the vaginal fornix by means of a firm tampon, is sometimes useful when it is impossible to ligate the oozing surfaces.

It is impossible to discuss the subject of sub- and intraperitoneal hæmatocele here; contrary to the opinion advanced by Savage, the peritoneum is capable of being separated from the subjacent tissues to such an extent as to allow of the formation of large extravasations beneath it. This is particularly noticeable during pregnancy; hence the possibility of making gastro-elytrotomy a strictly subperitoneal operation. Recent writers have expressed doubt as to whether pelvic abscess is ever confined to the cellular tissue—*i. e.* they believe that it is, nearly always, of tubal origin. The fact that such abscesses often lie wholly beneath the peritoneum should negative this theory.

The pouches formed by the pelvic peritoneum possess much practical interest. The bottom of the vesico-uterine pouch lies so far above the anterior vaginal fornix that it is not exposed to injury during operations in this region; the distance of the peritoneum from the fornix will be appreciated during the preliminary steps of vaginal extirpation of the uterus, as it is necessary to separate the bladder entirely from the uterus before the serous membrane is reached. It is accordingly advised to open Douglas's pouch and to retrovert the uterus through it before dividing its peritoneal attachments anteriorly. Unless there is an unusually low dip of the vesico-uterine fold, it will not be endangered in any ordinary operation on the cervix, short of high amputation. The bottom of Douglas's pouch, on the contrary, lies normally only one-third of an inch above the tip of the examining finger when introduced into the posterior fornix; this distance may be diminished, not only by the pressure of morbid growths, the fundus of a retroverted uterus, exudations, etc., but by the existence of an abnormally deep dip of the membrane, as in the condition described by Pirogoff, where it covered the posterior vaginal wall almost as low as the vulvo-vaginal outlet. Less significance is attached to the opening of the peritoneal cavity through the posterior fornix now that the principles of drainage are better understood. Note that the middle portion of the rectum is only partially covered by peritoneum (anteriorly), although sufficiently to be affected by inflammations and adhesions of that membrane.

The utero-sacral ligaments are, as before stated, essentially folds of peritoneum strengthened by fibro-muscular tissue; whether peritonitis or cellulitis is the inflammation most common in them is an open question. Probably both the serous and fibrous tissues are involved in nearly every case of so-called "parametritis posterior." They are commonly contracted in epithelioma of the cervix, even where the broad ligaments are not involved, and complicate the final steps of

vaginal hysterectomy. The supporting function of these bands will be discussed later.

As regards the much-vexed question of the relative frequency of peri- and parametritis, it may be added that the anatomical evidences are greatly in favor of the former, as will appear to the reader who considers the various sources of infection to which the peritoneum is exposed. The results of recent studies in tubal pathology have led to a change of views on the subject of pelvic inflammation.[1]

Pelvic Connective Tissue.

There are few subjects in the whole range of normal and pathological anatomy about which so much has been written—and blindly written—as that of the cellular tissue of the female pelvis. It is the *bête noire* of the student and the stumbling-block of the more mature. Instead of taking a rational view of the matter and remembering that connective tissue possesses exactly the same structure, appearance, and functions in whatever region of the body it may be found, nine men out of ten approach the study of the pelvic areolar tissue in somewhat the same spirit as they begin that of the brain—with the idea that they are about to grapple with a thing *sui generis*, the thorough mastery of which will be a formidable task. Doubtless writers on gynecology are responsible partly for this notion, since they have been somewhat disposed to adapt anatomical facts to pathological theories, instead of taking that broader view of the subject which can alone prevent one from falling into error, whether of theory or of practice.

The pelvis is not an independent region of the body, neither do its various tissues exist under different conditions from the same tissues in other portions of the body. In considering the pelvic areolar tissue as a whole instead of referring to it under the description of each organ, we not only gain a clear idea of its relations to the separate organs, but are able to appreciate better its close continuity with the entire fibrous framework of the body.[2] Although this continuity may not always be as clearly marked as in the case of the membrane which has just been studied, it is none the less present, as will be seen.

Connective tissue, whether it appears in the form of areolar or lymphoid tissue, cartilage, or bone, always has the same office—"to connect and support the other tissues, performing thus a passive mechanical

[1] Comp. paper by the writer on "The Exaggerated Importance of Minor Pelvic Inflammations" (*N. Y. Med. Journ.*, May 15, 1886; also paper by Prof. W. M. Polk in the *N. Y. Med. Record*, Sept., 1886.

[2] Freund (*Gynäkologische Klinik*, Strasburg, 1885) has complicated the subject by describing the connective tissue around the various organs by separate names. He refers to the "paracystium," "paracolpium," "paraproctium," etc.

function."[1] As viewed in the pelvis, it appears under two varieties or systems:[2] 1. As a loose tissue which is distributed apparently in a most irregular manner around and between organs, and between the layers of the broad ligaments, where it serves to support the blood-vessels, the folds of peritoneum, etc.; 2. As firm, well-defined laminæ or planes which enter into the formation of the pelvic floor, and together constitute the "pelvic fascia." The latter will be described with the pelvic floor.

Considered in its entirety, all of this connective tissue forms the middle layer of the three, which begins above with the peritoneum; it may be traced from before backward in a vertical median section, just as was done with the peritoneal layer, beneath which it lies throughout. Passing down the anterior abdominal wall below (that is, anterior to) the peritoneum, as low as the posterior aspect of the pubic symphysis, it stretches across to the anterior surface of the bladder, as the pubo-vesical, or anterior true ligaments of that organ. Immediately behind the pubes it contains a quantity of adipose tissue (retro-pubic fat), which has a triangular outline in mesial sections of the pelvis, the bladder being empty. The position of this pad of fat varies in different attitudes of the body: when the patient is in the genu-pectoral posture it sinks downward and forward, so as to be below (*i. e.* above) the symphysis. There is a certain amount of areolar tissue in the space bounded by the lower part of the posterior vesical wall in front and the cervix uteri and upper third of the anterior vaginal wall behind. This tissue contains a venous plexus, and serves to unite the vagina to the base of the bladder.[3] When the latter is empty this "vagino-vesical process" is all that intervenes between the peritoneum and the anterior cul-de-sac.

The lower two-thirds of the anterior vaginal wall are so firmly attached to the urethra by an intermediate layer of connective tissue that it is possible to separate them only by careful dissection. While the supravaginal portion of the cervix is surrounded by a quantity of loose fibrous tissue, on the fundus and anterior surface of the uterus, as well as beneath the vesico-uterine fold, there exists only the delicate subperitoneal layer before described (the "platysma" of Savage). Laterally, however, the tissue is again well marked, where it extends outward between the folds of the broad ligaments. This same platysma, composed as it is of fibrous, elastic, and smooth muscular tis-

[1] Schäfer, *Essentials of Histology*, p. 30.

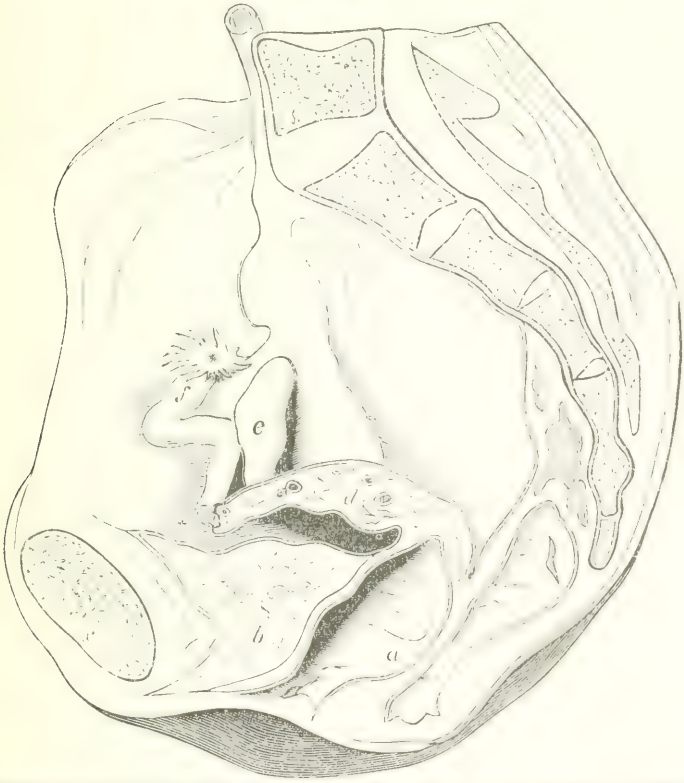
[2] The loose cellular tissue of the pelvis has been divided by some authorities into two "processes"—a "pubo-sacral," including the median portion of the layer, extending from the symphysis pubis to the sacrum, and a "utero-iliac," which comprises the fibres extending outward from the lateral borders of the uterus to the pelvic wall between the folds of the broad ligaments.

[3] It is the "parametric" tissue of Virchow.

sue, is reflected on to the tubes, round ligaments, utero-sacral, and ovarian ligaments, forming their superficial layer.

It is difficult to understand how some authorities can deny the presence of fibro-muscular tissue in the broad ligaments. Reasoning from analogy, the presence of such a rich vascular area as that which lies between these folds of peritoneum presupposes the existence of no inconsiderable quantity of such tissue in the immediate neighborhood

FIG. 72.



Mesial Section of the Pelvis, cutting at junction of Broad Ligament and Uterus: *a*, vagina, with its walls separated; *b*, bladder; *c*, symphysis; *d*, broad ligament; *e*, ovary; *f*, Fallopian tube. (Hart and Barbour).

of the blood-vessels.[1] This alone would be a convincing proof, even if it were not possible to trace with ease distinct bands of fibres which are continuous with the general connective tissue of the pelvis. Guérin's[2] idea, that the tissue between the folds of the ligaments has no connection with the rest, is not tenable, any more than if it was affirmed that the included vessels were independent of the general

[1] The reader will also remember that each fold of peritoneum has its own plaissma layer.

[2] Guérin, "Sur la Structure des Ligaments Larges," Paris, 1879, p. 1561.

pelvic circulation. In point of fact, the application of the term "ligaments" to these reduplications of the peritoneum is only justified by the presence in them of a strong fibrous and muscular framework, as was shown in the case of the sacro-uterine bands. Without such a framework they could not even furnish proper support to the vessels and nerves, not to speak of the uterine appendages. In short, the connective tissue of each broad ligament *is the ligament itself;* the peritoneal folds constitute simply a thin veil which is thrown over the former, but which does not increase its strength.[1] The tissue in question enters the broad ligament from various sources. The superficial muscular stratum of the uterus contributes numerous delicate fibro-elastic bands; others are reflected from the external layers of the tubes and round ligaments. The vessels carry with them their own supporting tissue and the peritoneal folds have their thin elastic substratum. The areolar tissue seems to be most abundant at the bases of the ligaments, where it blends with the mass already referred to, which surrounds the cervix uteri and roof of the vagina, filling the interval between these and the neck of the bladder. The richness of the blood- and lymph-supply of these parts was noted in another place. The practical importance of these facts will be evident in connection with the pathology of cellulitis.

Proceeding backward from the broad ligaments, we observe a thin subperitoneal layer on the posterior surface of the uterus; it is not so intimately united to the subjacent muscle as it is over the fundus and anterior aspect of the organ, so that a certain amount of separation of the peritoneum is possible. Between the rectum and the posterior vaginal wall there is a stratum of areolar tissue which extends downward as low as the apex of the perineal body, establishing a loose connection between the two canals (recto-vaginal process). The upper portion of this tissue surrounds the supravaginal portion of the cervix and the posterior fornix. As in the vesico-uterine pouch, it separates the fornix from the peritoneal cavity. The entire thickness of the tissues intervening between the latter cavity and the vagina is estimated at not over a third of an inch. The opinion has already been expressed that the "folds of Douglas," or utero-sacral ligaments, are true ligaments, consisting of bands of fibrous tissue enclosing elastic and muscular fibres, the latter being derived from both the uterine and the vaginal walls. Their direction is such (upward and backward) that they would lie almost in a line with the

[1] The unstriped muscular tissue of the broad ligaments is thickest near the borders of the uterus. As we trace them outward both the fibrous and muscular bundles decrease in number and size, until, on reaching the pelvic wall, they have almost entirely disappeared. Note that the bases of the broad ligaments are in contact with the lateral culs-de-sac of the vagina, except when the former are elevated during pregnancy (Ranney).

anterior wall of the vagina if it were extended backward (Fig. 73).[1] Luschka[2] well described both the structure and the functions of these folds when he applied to them the name *musculus retractor uteri*. The "pubo-sacral" process of connective tissue terminates in a thin layer which separates the rectum from the sacrum.

A description of König's method of demonstrating the continuity of the subperitoneal connective tissue by means of injections of air or fluids belongs more properly to the subject of experimental pathology. His results, as summarized by Bandl, were briefly as follows: On injecting water into the space between the folds of one broad ligament, the site of the injection being near the upper edge of the ligament, it first extended outward to the pelvic wall, then entered the iliac fossa beneath the peritoneum; from this point it made its way both upward along the anterior abdominal wall, and downward along the wall of the true pelvis. If injected below the base of the ligament, however, anterior to, and a little to one side of, the utero-cervical junction, it first spread in a lateral direction, and later distended the vesico-uterine subperitoneal space; it then made its way beneath the peritoneum covering the anterior surface of the supravaginal cervical segment and the posterior aspect of the bladder, and ran along the round ligament to the internal ring, turned to the left to follow the line of Poupart's ligament, and terminated in the iliac fossa. If fluid is introduced posterior to the base of the ligament, it first infiltrates the corresponding half of the posterior fossa, then extends to the iliac fossa, and eventually reaches the anterior abdominal wall as before.[3]

Practical Deductions.—Great importance has been attached to the manner of distribution of the pelvic cellular tissue in connection with the study of parametritis and abscess-formation. For details the reader must consult special works. In some localities it is evident that an inflammatory process may be limited to this tissue; in others (notably in the broad ligaments) it is difficult to conceive how the peritoneum can fail to be involved. The experiments of König and Bandl, in which fluid or air was injected into the cellular tissue of the pelvis in order to determine the course taken by collections of pus, explain the "pointing" of abscesses in the perineum, in the inguinal region, or even as high up as the umbilicus. König holds, briefly, that an exudation between the folds of the broad ligament eventually makes its way to the floor of the pelvis along the ilio-psoas muscle, while

[1] For an ingenious explanation of the action of these ligaments, consult Foster's paper on "The Mechanical Action of Pessaries," *Am. Gyn. Trans.*, 1881. Comp. Foster's diagram, reproduced by Ranney *op. cit.*, fig. 6.

[2] *Op. cit.*, p. 361.

[3] Elaborate experiments of the above character have been reported by Schlesinger (*Med. Jahrb. der K. K. Gesellschaft d. Aerzte in Wien*, Heft 1–2, 1878). See also Bandl, *op. cit.*, pp. 109–114.

a collection of pus forming near the side of the cervix follows the course of the cellular tissue at the lateral borders of the uterus, then passes beneath the inguinal canal along the round ligament, and, reaching Poupart's ligament, turns backward and outward to reach the iliac fossa. Rupture of a pelvic abscess into the peritoneal cavity is fortunately rare, spontaneous perforation into the vagina, rectum, or bladder being much more common. The danger of hemorrhage in incising an abscess through the fornix is not imaginary, and should render the thermo- or galvano-cautery preferable to the knife.

Subacute inflammation of the cellular tissue is a common result of puerperal lesions, especially laceration of the cervix. However we may differ in regard to the character and significance of the indurations which are found at the bases of the broad ligaments in cases of deep laceration of the cervix, we must admit that they do exist, and that they radiate directly outward from the angle of the tear. Dr. Emmet has attached great importance to their detection by palpation through the vaginal fornix, and to the advisability of endeavoring to promote their absorption by means of hot-water injections and local applications before the operator can safely or successfully repair the lacerated cervix. He is also inclined to regard utero-sacral cellulitis as a consequence of injury to the cervix—a sequence which, from the indirect relation of the parts involved, is by no means clear.

While the writer has no desire to dwell upon his personal views regarding the treatment of chronic cellulitis, he cannot avoid the temptation to propose to the reader the consideration of the following questions in the light of the foregoing anatomical studies: Are small cicatrices or strictly localized thickenings in the serous or cellular tissue of the pelvis capable of obstructing the circulation over a sufficient area to cause chronic engorgement of the uterus and its appendages? Does the constricting action of hot vaginal injections directly affect the vessels not contiguous to the fornix? Does the entire pelvic circulation feel their influence, or is anæmia produced in one locality at the expense of hyperæmia in another? Let the reader recall what has been said regarding the extent and continuity of the venous plexuses, and answer for himself.[1]

One more question may be permitted: Is it in the power of hot-water injections, iodine, and glycerin-tampons to act through the vaginal fornix in such a manner as to cause the absorption and disappearance of firm, non-vascular cicatricial bands, which may be situated within the pelvis from a third to half an inch from the spot

[1] It is claimed that in these questions we are dealing with known clinical facts. No one denies the local hæmostatic and astringent action of hot water; reference is made to its power to modify the circulation at distant points.

reached by the injection or application? Whatever direction our anatomical speculations may take, clinically we shall never regret the adoption of the routine practice of regarding with suspicion all evidences, whether subjective or objective, of former periuterine inflammation, and of restraining our *ardor operandi* accordingly.

Since the utero-sacral folds of peritoneum are, by reason of their contained connective tissue and mode of attachment, true ligaments, it seems advisable to study their normal and pathological action here. This V-shaped process, which can usually be distinctly felt through the posterior fornix, is attached to the uterus just above the isthmus, in such a line that it forms with the anterior vaginal wall what Foster has aptly called a "supporting beam"—the two structures opposing each other and retaining the uterus (which lies in the middle of the beam) in its normal position. That the ligaments contain a sufficient amount of muscular fibre to justify Luschka in calling them the "retractores uteri" is proved clinically, not only by the state of tension which is observed in them during a vaginal examination, but also by the fact that they often distinctly relax under the influence of an anæsthetic. The writer has affirmed, as the result of clinical and anatomical observations, that the diagnosis of "thickening of the utero-sacral ligaments" (parametritis posterior) is often based upon a supposed prominence or tension of these cords which is entirely normal. Every gynecologist must have noticed how moderate anteflexion, due to apparent shortening of the ligaments, has been practically eliminated after the patient was anæsthetized.

FIG. 73.

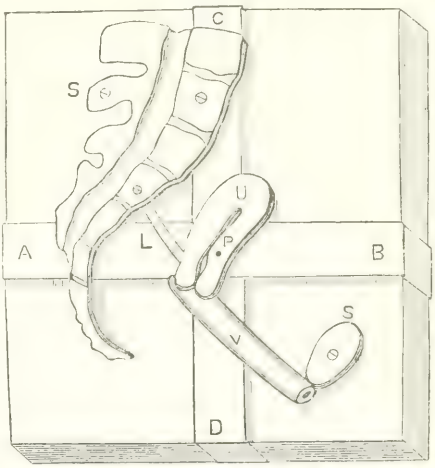


Diagram of Model designed to show the supporting action of the Anterior Vaginal Wall and the Utero-sacral Ligaments. (Foster.) *A, B, C, D*, two elastic bands intersecting at the point of attachment of the uterus, *U*, which is fastened to them by a pivot. *L*, *L*: symphysis pubis fastened firmly to block, as is also the sacrum (*S*); *U*, uterus rendered movable in all directions by the elastic bands; *V*, vagina, represented by a piece of rubber tubing; *L*, rubber band representing utero-sacral ligaments.

True cicatricial contraction of the utero-sacral folds (whether as the result of cellulitis or peritonitis, or of a combination of the two conditions) leads to anteflexion and vesical irritation, the latter symptom being one of the most trying with which the gynecologist has to deal. The futility of expecting to accomplish much by the use of anteflexion

pessaries will be apparent to any one who views the displacement even from a purely mechanical standpoint, since the problem is not to elevate the fundus, but to relieve backward traction on the organ. Neither does dilatation of the cervical canal for the purpose of overcoming the mechanical obstruction (with or without the introduction of a stem pessary) fulfil the main indication, which is *to stretch the shortened ligaments*. How far it is possible to accomplish this clinically by means of tampons, massage, etc. we shall not attempt to decide here.

Pelvic Floor.

Synonyms.—Pelvic diaphragm; *Lat.*, diaphragma pelvis; *Fr.*, plancher pelvien; *Ger.*, Beckenboden.

Definition.—By the pelvic floor we understand the *ensemble* of the soft parts which close the outlet of the pelvis. Strictly speaking, this definition includes several of the organs already described (the rectum, vagina, and bladder), as well as the serous and fibrous layers which have just been mentioned. We shall limit it to the actual diaphragma pelvis[2]—*i. e.* the levatores ani muscles, with the layers of fascia above and below them, the perineal body, with the muscles and fasciæ entering into its composition, the ischio-rectal fossæ, and the integument covering the whole.

In order to possess a clear idea of the diaphragm we may imagine that we are looking down upon it from above, after having removed the uterus and broad ligaments, together with the peritoneum, and cleared away as much of the loose connective tissue as suffices to expose the underlying fascia. We have now to consider from above downward—that is, from within outward—the following distinct laminæ: Two layers of fascia, a superior (recto-vesical) and an inferior (anal), between which are the levatores ani; below these is a space occupied posteriorly by the lower end of the rectum, with its muscles, and a quantity of fat (ischio-rectal fossa), and corresponding anteriorly to the cavity between the two layers of the triangular ligament. Still lower are the inferior boundaries of these spaces—behind, the obturator fascia; in front, the anterior layer of the triangular ligament. Next comes the deep layer of the superficial perineal fascia; and lastly, the superficial layer and the integument.

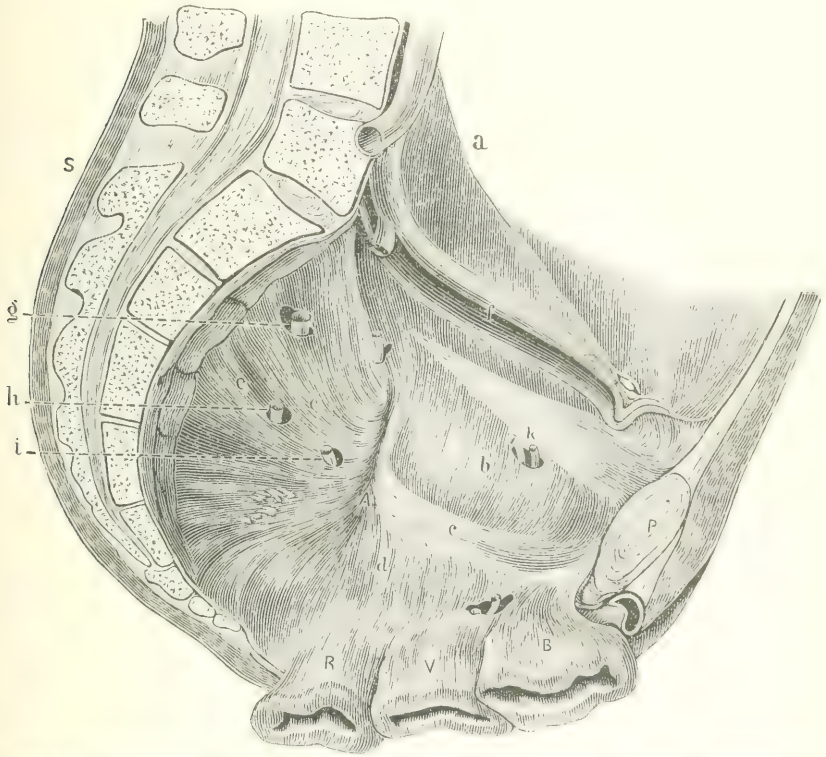
We may group the component parts of the pelvic floor into a superior and an inferior layer, the latter including the parts ordinarily exposed in a dissection of the perineum, which may be studied best from below. The superior or deeper parts will first be considered.

[1] For exhaustive details refer to Hart's monograph, "The Structural Anatomy of the Female Pelvic Floor," Edinburgh, 1881.

[2] Under this term German writers refer, as a rule, to the levatores ani alone.

Although the arrangement of the pelvic fascia is explained in all of the standard works on general anatomy, the descriptions nearly always have reference to the male pelvis, in which the relations of the parts are comparatively simple. In the female the floor is pierced by the vagina, so that a complication is thus introduced which renders a separate description of the parts necessary. The pelvic fascia, as viewed

FIG. 74.

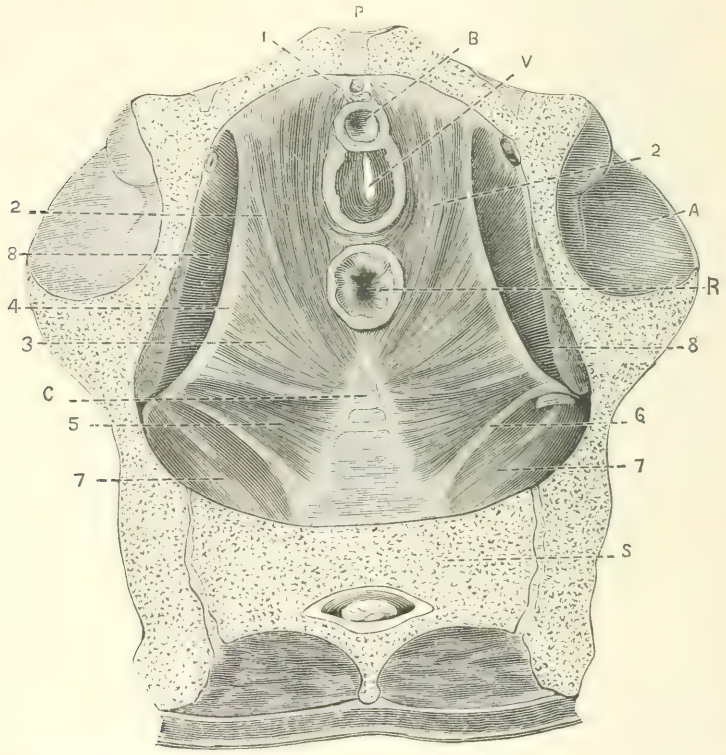


Fascia of Pelvic Floor (Savage): *B*, bladder; *V*, vagina; *R*, rectum; *P*, pubic symphysis; *S*, sacrum; *a*, fascia covering psoas muscle; *b*, obturator fascia; *c*, ilio-pubic line; *d*, reflection of fascia on to the rectum, vagina, and bladder; *e*, posterior portion of pelvic fascia covering sacral vessels and nerves; *f*, iliac fascia, covering iliac vessels; *g*, gluteal vessels; *h*, ischiatic vessels; *i*, internal pudic vessels; *k*, obturator vessels.

from above, is seen to be attached laterally to the pelvic brim; anteriorly, its line of attachment extends downward, following the origin of the obturator muscles, and terminates near the lower border of the symphysis pubis. As it crosses the obturator foramen the fascia becomes attached to the membrane which covers that opening. Posteriorly, it is adherent to the spine of the ischium, behind which point it is continuous with a thin lamina that covers the pyriformis muscle and sacral plexus (fascia of the pyriformis); the latter separates the sacral plexus

from the iliac vessels, branches of the latter piercing the pelvic fascia.[1] The attachment of the pelvic fascia is clearly indicated by a tendinous band ("white line") which extends from the spine of the ischium to the lower portion of the symphysis. From this line springs the recto-vesical fascia, which is now regarded as the direct continuation of the pelvic, instead of the obturator, fascia, as is still affirmed by many anatomists.[2] The recto-vesical process arises as above mentioned, extends downward and inward, lying upon the upper surface of the cor-

FIG. 75.



Muscles of Pelvic Floor (Savage): *B*, neck of bladder; *V*, vagina; *R*, rectum; *P*, symphysis pubis; *C*, coccyx; *S*, sacrum; *A*, acetabulum; 1, anterior vesical ligaments; 2, pubo-coccygeal portion of levator ani; 3, obturator-coccygeal portion; 4, ilio-pubic line of the latter; 5, ischio-coccygeal portion; 7, pyriformis muscle; 8, obturator muscle.

responding levator ani, and unites in the median line with the fascia of the opposite side. The fascial diaphragm thus formed, which separates the pelvic from the perineal space, is perforated by two slits, the vagina and the rectum. It is firmly attached to the walls of these canals, and

[1] Comp. Quain's *Anatomy*, vol. i. p. 326; Ellis, *Dissections*, p. 546; Carrington, *Dissections*, pp. 145 and 160–167; Heath, *Practical Anatomy*, pp. 266–268.

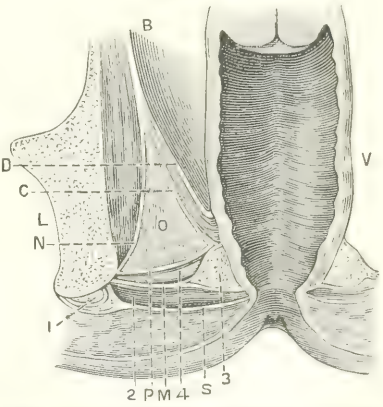
[2] Carrington, *op. cit.*, p. 161; also Quain, *op. cit.*, p. 326.

sends off from its under surface fibrous sheaths which surround and follow the tubes downward.

The rectal sheath covers the lower three inches of the bowel, gradually disappearing toward the anus; it lies immediately over the superior hemorrhoidal vessels. The vagina also has an envelope, which may be traced along the tube to its lower end, where it becomes lost in the deep perineal fascia (?). It covers the vaginal plexuses and constitutes the external layer of the vaginal wall.

The bladder also receives support from the same source, the anterior true ligaments being formed by two processes which extend from the back of the pubes (the anterior attachment of the fascia) to the neck of the bladder; between these special processes the recto-vesical fascia is said by Ellis to descend to the triangular ligament of the urethra, of which it forms the posterior layer.[1] The lateral ligaments of the bladder are formed by fascial bands which are attached to the postero-lateral border of the vesical base. The rectum has also two lateral ligaments derived from the same fascia, which are attached externally to the ischial spines, and oppose lateral displacement of the gut.

FIG. 76.



Perpendicular transverse Section of Pelvis through middle of Vagina (Savage): *V*, vagina, showing posterior wall; *O*, ischio-rectal fossa, filled with fat; *I*, ischial tuberosity; *B*, inferior pelvic space; *D*, recto-vesical fascia, covering upper surface of levator ani; *C*, fascia covering lower surface of levator ani; *N*, obturator fascia; *P*, posterior aponeurosis of perineal septum; *M*, anterior aponeurosis of same; *S*, deep layer of superficial perineal fascia; 1, cross-section of right crus clitoridis, including erector muscle; 2, superficial transverse perineal muscle; 3, bulb of vagina; 4, muscle of perineal septum.

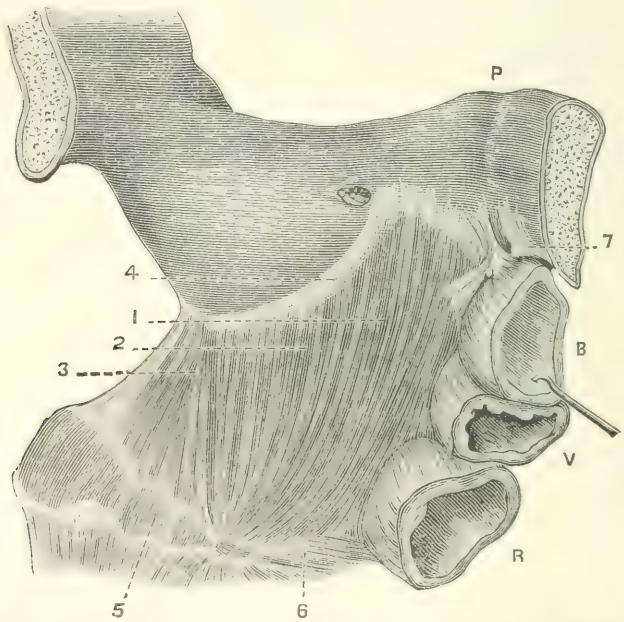
On removing that portion of the recto-vesical fascia of both sides which covers the floor of the pelvis, by detaching it along the entire length of the white line externally and from its attachments to the pelvic organs internally, the subjacent muscular stratum will come into view (Fig. 75). This consists of two pairs of muscles, the coccygei and the levatores ani, the former being comparatively unimportant in this connection. The coccygei (levatores coccygis, ischio-coccygei of Savage) are two thin, triangular muscles which spring from the upper portions of the ischial spines, and by a few slips from the lesser sacro-sciatic ligaments, and pass inward, gradually expanding into broad, thin laminæ that are attached to the lateral borders of the lower segment of the sacrum and to the anterior surface and

[1] Denied by Carrington (*Manual of Dissections*, p. 165), who insists that the deep layer is formed by the obturator fascia.

borders of the coccyx. Their inner (pelvic) surfaces are covered by special layers of fascia continuous with the recto-vesical. The upper surface of the left coccygeus is in contact with the rectum, which it partially supports. The lower surfaces rest upon the glutei maximi and the lesser sacro-sciatic ligaments; in front are the posterior borders of the levatores; behind, the pyriformis muscles, separated from the pair under consideration by vessels and nerves.

The levatores ani have such extensive origins and insertions that each muscle is divided by Savage into two separate portions, pubo- and obturato-coccygeal. The coccygeus muscle he includes with the levator under the name of the ischio-coccygeus. Each levator arises in front from the posterior aspect of the pubes near the symphysis (pubo-coccygeus), behind, from the lower and inner surface of the

FIG. 77.



Attachment of the Muscular Floor of the Pelvis to the Bladder, Vagina, and Rectum (Savage): *B*, bladder; *V*, vagina; *R*, rectum; 1, pubo-coccygeus; 2, obturato-coccygeus; 3, ischio-coccygeus; 4, ilio-pubic attachment of muscle; 5, coccygeal attachment; 6, median raphé; 7, *Arcus tendineus* of Luschka, aponeurotic fibres reflected to bladder.

ischial spine, and between these origins from the "white line" that represents the point of division of the pelvic fascia. It is also connected by fleshy slips with the obturator fascia and the posterior layer of the triangular ligament. The anterior fibres may form a separate bundle, an interval existing between them and the rest of the muscle; these extend downward and inward contiguous to the posterior layer

of the triangular ligament, and unite in the median line of the pelvis with the corresponding portion of the opposite muscle. The urethral and vaginal slips perforate the muscular diaphragm here, and receive slips from it; behind the vagina the internal fibres of opposite muscles meet and blend with the deep transverse perineal muscles in the perineal body. The prolongations of the pubo-coccygeus on the sides of the vagina and urethra correspond to Santorini's muscles (levatores prostatæ) in the male.[1] The posterior portion (Fig. 77) of the pubo-coccygeus (corresponding with the middle portion of other anatomists) unites with its fellow to surround the lower end of the rectum, which it suspends as if in a sling, and blends with the external (and, to some extent also, with the internal) sphincter. The most posterior of the fibres unite behind the rectum in a median raphé which terminates at the end of the coccyx. The posterior part of the levator (the obturator coccygeus of Savage) meets its fellow in the raphé behind the rectum, and both are inserted into the sides of the last two coccygeal vertebræ, below the insertions of the coccygei (ischio-coccygei).

From the above it will be evident that the levatores ani form a thick septum across the pelvic outlet, the general shape of which is concave; this septum at its periphery has bony attachments extending around the brim of the pelvis, while its centre has no fixed support. In the median line it is weakened by the presence of the vaginal slit, which defect is obviated to some extent by the fact that the vaginal walls are normally in close apposition, and that the canal cuts the pelvic floor at an angle of about sixty degrees (Hart and Barbour). The firm attachment of the muscular diaphragm to the genito-urinary organs is an important factor in connection with the maintenance of their proper positions.

A thin layer of fascia covers the under surface of the levator; it arises from the pelvic brim below the origin of the muscle, and is attached to the obturator fascia, while in the median line it blends with the opposite lamina and is attached to the rectum and vagina in the same manner as the recto-vesical fascia, although it is much less developed than the latter. Anteriorly, it is attached to the posterior layer of the triangular ligament. It is in immediate relation below with the fat which fills the ischio-rectal fossa. A description of the obturator fascia does not really belong here, since it merely covers the inner surface of the obturator muscle, and thus forms the outer wall of the ischio-rectal space.

After removing the layers above mentioned there remain only the superficial structures which close the pelvic outlet. The ischio-

[1] Note that Savage's description of the insertion of the pubo-coccygeus is peculiar, in that he represents the fibres as running downward and backward, rather than downward and inward.

rectal fossæ do not need a special description, since their anatomy is the same as in the male. The perineal body, on the contrary, is a structure peculiar to the female.

The Perineal Body.[1]

Synonyms.—*Gr.*, *περίναιον*; *Lat.*, perinæum; *Fr.*, périnée; *Ger.*, Damm; *It.* and *Sp.*, perineo.

Between the lower ends of the rectum and vagina is a somewhat pyramidal space, formed by the divergence of the two canals that have been described as lying in close contact as low as an inch and a half above the anus. This space is filled by a mass of fibro-muscular tissue, which is attached not only to the anterior wall of the rectum and the posterior wall of the vagina, but also to the pelvic floor. Its dimensions are variable, depending not only upon the muscular development of the individual, but upon the amount of adipose. It is common to represent it in mesial sections as a perfect triangle. It is highly desirable that these diagrammatical figures should cease to be reproduced in modern textbooks, to mislead the inexperienced reader and to give him false ideas of the aims of gynecological surgery. Now that the "keystone" theory of the perineum has been rejected by all thoughtful men, the inaccurate representations of the supposed keystone should not be retained as the *exuviæ* of a discarded error. The perineal body is neither a triangle nor a pyramid, but, as we learn from a careful study of the region both in the living female and in frozen sections, it is irregularly quadrilateral in form;[2] sometimes it has almost the shape of a gourd, the neck of which corresponds to the "apex" of the triangle, as formerly described.[3]

The quadrilateral shape of the perineum is, as Foster has shown by careful measurement, largely the result of muscular action, which draws the body forward, causing a prominence near the ostium vaginæ that forms the anterior angle of the square. Two sides of the square rest thus against the vaginal wall, a third looks toward the rectum, and the fourth represents the space between the posterior vulvar commissure and the edge of the anus. If, as the same writer states, through weakness of the muscles attached to the perineal body, it is not drawn forward in the usual manner, it may present but a single surface anteriorly, and then it has the triangular shape usually figured. As before stated, its dimensions are variable. Its upper limit—or rather the point at which the rectum and vagina begin to diverge—is about an

[1] For literature refer to Hart and Barbour, and to Ranney's paper on "The Female Perineum" (*N. Y. Med. Journ.*, July and Aug., 1882).

[2] Foster, "Topograp. Anat. of Uterus, etc.," *Am. Journ. Obstet.*, vol. xiii., 1880.

[3] "The cucurbit of an alembic" (Garrigues, *Am. Journ. Obst.*, April, 1880).

inch and a half from the anus. The presence of a thick layer of adipose in a fat subject will of course increase the distance between its apex and the surface of the integument. The transverse measurement is an inch and a half, the antero-posterior from three-quarters of an inch to an inch. Its relations have already been mentioned. Anterior to it lie the vagina, behind, the rectum and anus, laterally, fat; below, the integument of the perineal space, above, the lower end of the fibrous septum uniting the vaginal and rectal walls. The entire body lies below a horizontal plane passing through the subpubic ligament in front and the tip of the coccyx behind.

Hitherto we have followed the dissection of the pelvic floor from above. The perineal body is best understood by adopting the usual order described in manuals of dissection. Unfortunately, there is much confusion as to the exact meaning of the term "perineum," nearly all of the works on anatomy defining it as the entire lozenge-shaped space which corresponds to the pelvic outlet. Others divide this space into an anterior and a posterior perineum, the latter including the anus and the ischio-rectal fossæ, the former, the parts included between the symphysis and pubic rami as far backward as an imaginary transverse line joining the tuberosities of the ischium. "The *true* perineum of the female," adds a writer, after making the above division, "is between the posterior commissure of the labia and the anal orifice."[1] The only satisfactory way out of the difficulty is, as Hart and Barbour suggest, to keep always before the mind the idea of a perineal *body*, of which the "perineum" of the anatomists is merely the "skin over the base."[2]

In reviewing briefly the anatomy of this region reference will be made to certain structures closely related to it which have already been mentioned in connection with the external genitals. Having removed the integument, not only over the perineum proper, but over the entire urethral triangle, the superficial fascia will be exposed. This may be separated into two layers—a subcutaneous, which consists of fine trabeculæ of fibrous tissue enclosing masses of fat and branches of the superficial perineal and hemorrhoidal vessels and nerves, and a deep layer, which is of considerable importance. The latter is attached along the anterior edges of the pubic and ischiatic rami[3] almost as far back as the tuberosities. It is limited posteriorly by the transversus perinei muscles, around which it turns to become continuous with the subpubic fascia (anterior layer of the triangular ligament, perineal septum of Savage). The lower edge of the perineal septum, which is strengthened by the attachment of the deep layer of fascia, is called the ischio-peri-

[1] Heath, *Practical Anatomy*, p. 173. [2] Hart and Barbour, *op. cit.*, p. 38.

[3] Savage describes an "abdominal portion," which is attached to Poupart's ligament (*op. cit.*, p. 13).

neal ligament by Savage, who describes it as "an extremely resisting aponeurotic band attached by its outer ends to the rami of the ischium, somewhat in front of their tuberosities. They are confounded," he adds, "in the structure of the perineal body." The perineal septum, as described and figured by Savage, is best understood by a reference to the figures. This fascia can be traced directly into the labia majora, and through them to the external inguinal rings, to the edges of which it is attached, forming on each side the "pudendal sac" (*sac dartoïque*) before described, in which the terminal fibrils of the round ligaments are found.

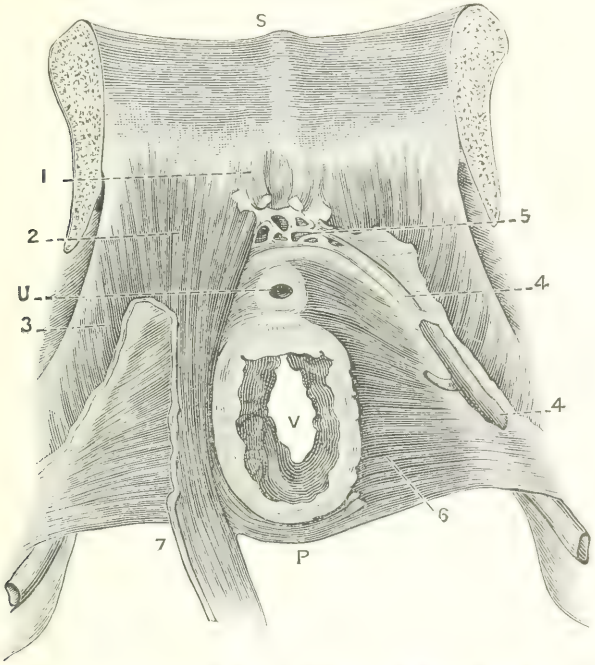
On clearing away the tissue above mentioned, which, with the integument and superficial fascia, is intimately related to the base of the perineal body, the so-called perineal muscles will be exposed, as well as the "perineal septum," or anterior layer of the triangular ligament, in recent nomenclature. The latter is comparatively a weak structure in the female, because of the manner in which it is encroached upon by the urethra and vagina. The muscles which are immediately connected with the perineal centre, as it is sometimes called, are the bulbo-cavernosi, transversus perinei, sphincter, and levatores ani (pubo-coccygeal portions). The transverse perineal vessels and venous plexuses will be exposed with the muscles.

The bulbo-cavernosi blend posteriorly with the perineal body; encircling the vaginal bulbs and vestibule, each divides, according to Henle, into three slips, one of which may be traced to the posterior surface of the bulb, another to the lower surface of the corpus cavernosum clitoridis, while the third is lost in the mucous membrane of the vestibule. The function of these muscles is *not*, as is frequently stated, to contract the vaginal outlet (which office is performed by the anterior portion of the levator ani), but to compress the bulbs. The transversus perinei are sometimes divided into two layers, a superficial and a deep, separated by the anterior layer of the triangular ligament. They appear almost invariably in actual dissections as pale, indistinct slips, which spring from the rami of the ischium and anterior layer of the triangular ligament, and are lost in the perineal body. The anal sphincter, which has been described, blends anteriorly with the muscles above mentioned; some of its peripheral fibres are apparently continuous with those of the bulbo-cavernosi. The pubo-coccygeus (anterior portion of the levator ani), as viewed from below, lies deeper than the preceding muscles (*i. e.* above them), as it is *behind* the perineal septum (Fig. 78). It encircles the vagina, and its inner fibres curve inward behind that canal to enter the perineal body behind the lower edge of the septum. When traced farther backward they surround the rectum in a similar manner between the two sphincters, and blend with the terminal fibres of the longitudinal layer of the rectum.

The erectores clitoridis are not properly included in this dissection, and are described with the clitoris.

Removing the bulbo-cavernosi and the vaginal bulbs, which rest upon the anterior layer of the triangular ligament, the latter is seen to be perforated by branches of the pudic arteries and nerves and by

FIG. 78.



Perineal Septum, posterior view (Savage): *S*, posterior surface of symphysis; *U*, urethra; *V*, vagina; 1, pubic attachment of bladder; 2, pubic attachment of levator ani (pubo-coccygeus); 3, line of attachment of obturato-coccygeus; 4, pudic vein; 5, urethro-pubic plexus of veins; 6, posterior surface of septum; 7, median portion of pubo-coccygeus, entering perineal body at lower edge of septum.

the communicating veins which extend from the bulbs and clitoris to the vesical plexuses. When the layer itself is detached, the following structures are exposed: The urethra, surrounded by the compressor urethræ[1] of Guthrie, the constrictor vaginæ of some authors;[2] the deep transversus perinei, the vulvo-vaginal glands, internal pudic vessels and nerves, dorsal vein and nerve of the clitoris, and artery of the bulb. The two former muscles are described by Heath as forming a figure-of-8 around the urethra and vagina, being attached anteriorly to the posterior aspect of the pubic arch, and entering the perineal body behind. Behind the above structures lies the deep layer of the tri-

[1] Ellis, *Trans. Roy. Med.-Chir. Soc.*, vol. xxxix., 1856.

[2] Why not include these two muscles in one as the sphincter vaginæ of Luschka?

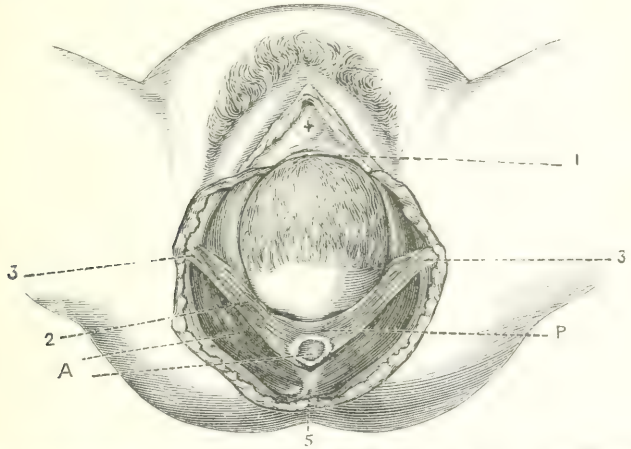
angular ligament, belonging to the pelvic fascia, which was studied from above.

The vascular and nervous supply of the urethral triangle may be dismissed in a few words, since it presents no special points of difference in the two sexes. We are most concerned here with the vessels and nerves of the perineal region. The arteries spring from the internal pudics, which, after re-entering the pelvis through the lesser sacro-sciatic foramina (each artery being accompanied by two veins and a nerve), skirt the outer edges of the ischio-rectal fossæ, ascend the pubic rami, perforate the posterior layer of the triangular ligament, and continue to ascend between the two layers until within a short distance of the symphysis, where each terminates in the artery of the corpus cavernosum and the dorsal artery of the clitoris. The inferior or external hemorrhoidal arteries of the pubic are two or more small branches which leave the main vessel in front of the tuberosity, cross the ischio-rectal fossa, supply the external sphincter and the posterior part of the levator ani, and terminate by anastomosing with the vessels of the opposite side beneath the skin around the anus and in the superficial perineal fascia. The superficial perineal branch arises in front of the hemorrhoidal, pierces the deep perineal fascia, crosses the transversus perinei muscle, and extends forward beneath the superficial fascia to the vulva. It sends deep branches to the surrounding muscles, and superficial twigs to anastomose with those from the hemorrhoidal arteries. The transverse perineal branch perforates the posterior layer of the triangular ligament, and follows the course of the transversus perinei muscle inward, where it divides into branches that anastomose with those of the opposite side at the perineal centre beneath the deep layer of the superficial fascia. It may send branches to the corresponding vaginal bulb and gland of Bartholin. The veins of the perineal region communicate freely with one another and with the hemorrhoidal and labial plexuses, as well as with the bulbs; they accompany their respective arteries and terminate in the pudic veins. The lymphatics unite with the vessels from the external genitals to enter the inguinal glands.

The perineal body is supplied exclusively by branches of the pudic nerve; the pudendal branch of the small sciatic may send a twig which enters the superficial perineal fascia. The inferior hemorrhoidal branch of the pudic accompanies the vessels of the same name and has a similar distribution; the superficial perineal branches supply the vestibular area, the labia, and integument covering the base of the perineal body, communicating with the hemorrhoidal branch. The deep perineal nerve accompanies the superficial vessels and supplies the labia, vaginal bulbs, and glands, sending special twigs to the perineal and urethral muscles.

From this brief account of the structures in immediate relation with the perineal body it will be seen that, aside from the support which it gives to the anterior rectal wall, its principal office seems to be to form a *point d'appui* for the muscles and fasciæ which have been mentioned as constituting the superficial portion of the pelvic floor, and that the only way in which it can be said to furnish support to the internal genital organs is through its connection with the floor. That its relation with the deeper structures is not particularly intimate will be inferred from the fact that it receives only a few of the more internal fibres of the pubo-coccygei. Its base, on the other hand, is closely connected with the superficial portion of the floor, especially with the strong ischio-perineal ligament, which in parturition bears the brunt of the expulsive force during the emergence of the child's head (Fig. 79).

FIG. 79.



Relations of the Muscular Floor of the Pelvis to the Presentation at the Last Stage of Parturition: 1, upper margin of vaginal ring; 2, ischio-perineal ligament and superficial transverse muscle; 3, their attachments to the tuberosities of the ischium; 4, lower part of the pubo- and obturato-coccygeus muscles; *p*, perineal body; *a*, anus.

Want of space forbids our entering upon a discussion of the interesting subject of the structural anatomy and physics of the pelvic floor, which have been so admirably treated by the Edinburgh authors, from whom we have borrowed freely. It may be stated, briefly, that, according to Dr. Hart's theory,[1] the floor may be divided into two segments, a pubic, including the bladder, urethra, anterior vaginal wall, and peritoneum covering the bladder, and a sacral, made up of the rectum, perineal body, and posterior vaginal wall. Ranney, following a suggestion of Foster's,[2] offers a different division, which is rather better. He includes in the pubic segment the parts above mentioned plus the uterus and utero-sacral ligaments. The pubic segment is then attached

[1] *The Structural Anatomy of the Female Pelvic Floor*, 1881.

[2] Made in a paper on "The Mechanical Action of Pessaries," *Am. Gyn. Trans.*, 1881.

somewhat loosely to the symphysis, more firmly to the sacrum. Parallel with the former is the sacral segment, which is "firmly dovetailed into the sacrum and coccyx." Without going into details, it will at once be evident that the sacral segment, as a whole (including the perineal body), acts as a support to the pubic, and thus (acting with the utero-sacral ligaments) maintains the uterus in its normal position.

The writer can subscribe only in part to Foster's positive statement, that "except to resist extreme displacements of the organ the broad ligaments, the round ligaments, the bladder, the rectum, and the perineum take *no* part among the supports of the uterus." It seems better to regard the uterus, as well as the vagina, as upheld by the "compact, unbroken pelvic floor," the perineum being "only a small, though strong, part of the sacral segment."

Another point which ought not to be overlooked in this hasty glance at the architectural anatomy of the pelvic floor has reference to its projection beyond the conjugate of the outlet. This has been studied by several, especially by Foster, to whose paper the reader is referred for details on this subject, as well as for careful measurements of the bony pelvis.[1] His average estimate of this projection is 2.5 cm., the patient being semi-prone.

Regarding the perineal body as simply a portion of the sacral segment of the pelvic floor, we shall be disposed to attach less importance to lacerations of the body which do not involve the sphincter. The mechanism of prolapsus becomes much more satisfactory when viewed in connection with the theory that "the chief support (of the uterus) is the compact, unbroken pelvic floor," while the gynecologist now regards the useful rather than the beautiful in the performance of perineorrhaphy.

Although Dr. Emmet was not the first to affirm the insignificance of the perineal body as a support, he has deduced the practical lesson that laceration of the perineum alone impairs but little the integrity of the uterine support, whereas overstretching, or tearing of, the fascia or muscles (levatores ani) of the floor at their attachment to the vagina, as the result of parturition, at once disturbs the delicate adjustment of the pelvic organs. This theory, so correct logically, has, unfortunately, not yet received confirmation through careful dissections. Assuming that the injury in such cases involves the deeper tissues, and that it is not repaired by closing the perineum alone, it remains to inquire if the new operation proposed by Dr. Emmet does fulfil the indications. Granting that the tissues of the pelvic floor are lacerated, does the operator reunite the torn ends by passing his sutures blindly through the posterior vaginal wall, or is the operation simply a modified posterior colporrhaphy, the ultimate result of which is simply to narrow the vagina by the removal of redundant tissue?[2]

[1] *Am. Journ. Obstetrics*, vol. xiii p. 30.

[2] Comp. Emmet, *op. cit.*, ch. xx.

MALFORMATIONS OF THE FEMALE GENITALS.

By HENRY J. GARRIGUES, A. M., M. D.,
New York.

All malformations are referable to one of two large classes. The first of these comprises those cases which are due to an *excess* of growth, which again may be a mere *hyperplasia* or uncommon size of an organ brought on by an increase in the number of constituent histological elements, or *hypertrophy*, by which is designated the condition in which the elements themselves are enlarged; or, on the other hand, the excess may be characterized by a *multiplication* of organs. To the other much more numerous and important class belong all those cases which are referable to an *arrest of development*.

Why an organ should increase in size beyond the ordinary limits, or why it should appear in a larger number than usual, is not clear. We must be satisfied with stating the fact that sometimes organs do obtain larger dimensions than in the majority of cases. Still less can we understand in most cases how a multiplication of organs is brought about, apart from those cases where there evidently is a double fœtus, parts of which have not been developed, while the two fœtuses have grown together. We do not know by what process sometimes a child has six fingers instead of five, four breasts, etc.

In the second class our intellect finds more satisfaction. What formerly was a chaotic mass of different freaks of Nature has, to a great extent, become a system of well-connected links which are easily understood as soon as we study them in the light of embryological development as described in the preceding article.

The Ovaries.

Sometimes the ovaries in newborn children are found twice as large as normal. In some cases it is a simple hyperplasia, with an even increase of all the constituent parts, but oftener we find a preponderance of connective tissue and a more or less complete disappearance of Graafian follicles—a condition which may be looked upon as the result of a fœtal inflammation.

Supernumerary ovaries are, according to Beigel, not rare. He found them 23 times in 500 autopsies of adult women. They were only small bodies, of the size of a pea or a hazelnut, but showed on microscopical examination the complete structure of the ovarian tissue, especially follicles, the characteristic element of an ovary. They had thin pedicles, and were found near the peritoneal border of the normal ovary, and once on the surface of the broad ligament.

Sometimes the ovaries present more or less deep fissures. In other cases two parts have been found bound together with a ligament, and in a case of Grohe there was a large ovary on one side and two small ones on the other, the inner one of which was bound to the uterus by an ovarian ligament, the outer one not (Puech). This is probably only a further division of one ovary.

Olshausen removed a large multilocular ovarian cyst which was bound by a pedicle to the uterus, and yet two normal ovaries were found in their places imbedded in a mass of inflammatory adhesions.

Winckel has photographed a somewhat similar case to Grohe's, and an unique case in which a supernumerary ovary as large as a normal ovary was bound to the uterus by a separate ovarian ligament.[1]

The possibility of the presence of a supernumerary ovary must be borne in mind as one explanation of the occurrence of pregnancy after double ovariotomy, a case of which occurred in Norway some years ago (Leopold Meyer).

Both ovaries may be *absent*—a condition commonly only found in the rare cases of total absence of the uterus. The congenital absence of the ovaries entails absence of menstruation, but the female type and sexual appetite have been found normal. One ovary may be totally absent in an individual with a one-horned uterus.

That the ovaries are not found in their usual place is not a sufficient proof of their absence. In consequence of a deficient descent they may be found in the lumbar region—a condition which, however, is very rare, and has only been found in connection with great arrest of development in other respects.

Sometimes the ovary is found in the inguinal canal, or even in the corresponding labium majus. This may be due to a faulty development. If the round ligament, instead of acquiring its normal length, stays short, it drags the tube and ovary and sometimes the horn of a bicornous uterus through Nuck's canal; that is, the prolongation from the peritoneum which surrounds the round ligament during its passage down through the inguinal canal to its attachment to the mons Veneris and the large labia.

More rarely, the ovary alone, without the tube, is found in such a congenital hernia. That it can come down during intra-uterine life is

[1] Winckel's *Pathologie der Weiblichen Sexualorgane*, p. 28 and table xxxiv. fig. 7.

easily understood when we examine the relative size of the ovary and the canal. From the fourth to the sixth month of fœtal life the latter is 6 millimeters wide (Puech), and in the fifth month the ovary is 1.6 millimeters thick and 2.4 millimeters high (Kölliker). It is of so much greater importance to bear in mind that the ovary can be found in these unusual localities, as it has here become the seat of diseases, such as cystic or cancerous degeneration, requiring surgical interference.

Sometimes one or both ovaries become severed from the genital apparatus by fœtal inflammation, and may either be found adherent to some other part or floating free in the abdominal cavity.

More common than the total absence of ovaries is a *rudimentary development* of these organs, either with preservation of Graafian follicles or with total loss of these latter, in which case the ovary is only formed by a mass of connective tissue. As a rule, the rudimentary development of the ovaries is combined with a similar deficiency in the formation of the uterus; but sometimes well-developed ovaries are found together with the arrest of development of the uterus; and, on the other hand, the atrophy of the ovaries may be found in women with well-developed uterus and external genitals. Sexual desire may be present, but such women do not menstruate.

Virchow has shown that the rudimentary development of the ovaries is sometimes combined with congenital faults in the large blood-vessels, especially stenosis of the aorta; and Morel has pointed out the frequent combination of a rudimentary development of the ovaries with a similar deficient development of the nerve-centres, especially in cretins and idiots.

The Fallopian Tubes.

The oviducts are sometimes unusually large. In most cases this increase is the consequence of the presence of a tumor with which the tube is more or less intimately connected. But even in the absence of all other abnormities the tubes have been found 16 or 17 centimeters (about 6½ inches) long.

Another kind of excessive formation is constituted by *supernumerary ostia* surrounded by fimbriæ. These openings may be found on one or both tubes. They are always situated at the upper surface and near the abdominal end. How they are produced is not yet known. If Waldeyer's views about the formation of the Fallopian tube as an originally open canal (see p. 68) were true, these openings might be looked upon as the result of an arrested development; but the formation of the fimbriæ which surround them would still place them among malformations by excess.

The tubes may be *absent*—a condition which is usually combined with a defect of the uterus, or at least with a solid, untunnelled uterus.

The absence of one oviduct is found in cases of a one-horned uterus. In one case the tube on one side was absent, although the uterus was well developed.

All these varieties are easily understood when we remember that the tubes are only the upper part of the Müllerian ducts, a malformation or destruction of which must result in corresponding deficiencies in the Fallopian tubes.

Sometimes the tubes are only represented by feeble streaks of connective or muscular tissue at the upper edge of the broad ligaments. At other times the tubes, in their whole course or in some part of it, are represented by solid strings. This condition is explainable when we remember that according to the generally accepted doctrine the Müllerian tubes begin as solid filaments, in which there subsequently appears a bore.

At the fimbriated end of the tube is often found a pea-shaped cyst called *Morgagni's hydatid*. Its interior is lined with ciliated epithelium like that of the tube, and it contains a clear fluid. Formerly this cyst was taken to be the upper end of Müller's duct, but, as we have seen, this is never closed. Besides, this cyst is only found in one out of five women (De Sinéty). It is therefore now looked upon as a pathological formation. Occasionally it becomes enlarged: I have myself seen it the size of an English walnut.

The Uterus.

In studying the malformations of the uterus, more than in any other part of this disquisition, it is of the greatest importance to keep in mind the teachings of the history of fœtal development. If we remember that this organ is formed by the fusion and further development of the middle parts of the Müllerian ducts, which themselves are originally solid filaments, we will easily understand that that part of those ducts which should form the womb may have originally been absent or may have been destroyed, or that the filaments continue to be solid columns without bore, or that the muscular tissue which in the course of time should surround these tubes fails to be produced, or that fusion between the tubes does not take place at all or does so only imperfectly, or that one tube undergoes its regular development while the other lags behind or is altogether absent. On the other hand, an excess of development may take place. Thus we will have to consider the following conditions:

A. Excessive development.

B. Arrest of development during the first half of intra-uterine life:

I. Absence of uterus.

II. Rudimentary uterus.

III. Uterus duplex separatus.
IV. Uterus unicornis.
V. Uterus bicornis.
VI. Uterus septus.
VII. Uterus subseptus.
VIII. Atresia uteri.

C. Arrest of development during the second half of intra-uterine life:
I. Uterus fœtalis and uterus infantilis.
II. Uterus pubescens.
III. Uterus incudiformis.
IV. Uterus parvicollis or acollis.
V. Anteflexion.

D. Irregular development:
I. Obliquity.
II. Lateroposition.
III. Anteposition.
IV. Postposition.
V. Hernia uteri.
VI. Abnormal communications.

A. Excessive Development and Precocity.

Sometimes the uterus of newborn children has been found to equal that of a girl near puberty, not only in size and mass, but in the proportions between the neck and the body. (See p. 90.) In many cases menstruation has begun in early childhood. Kerkring saw it appear at the birth of the child and continue regularly. Langlade and Cummen observed it between the eighth and the twentieth day of the child's life (Klob). Bouchut has published the history of a child four years old who had well-developed breasts, pubes, and external genitals, and who had menstruated regularly since it was twenty-two months old.[1]

Prochownick has proved by post-mortem and microscopical examination that such a case of precocious menstruation was combined with, not to say depended on, a precocious development of the uterus and the ovaries. The child was scrofulous and rickety, three years old, and had menstruated regularly, for the last two years, three days in every four weeks. The child died immediately after a menstruation. The breasts were only a little developed, but on either side a small movable lump of glandular tissue was found. The hair-growth was somewhat more abundant than normal. The vagina measured 5 centimeters, the uterus 4 cm., two of which belonged to the body; that is, twice the normal depth. The inside had a greenish color and was covered with a thin

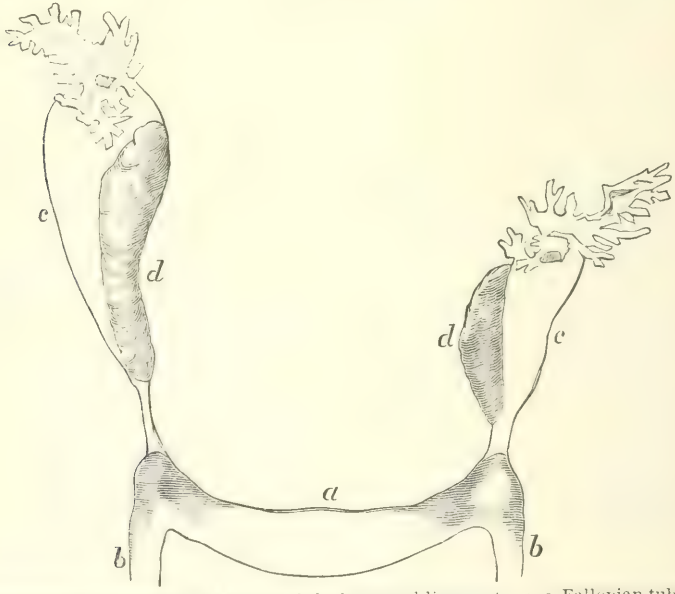
[1] *Paris Médical*, Dec. 22, 1876.

greenish-yellow mucus, although the parts were entirely fresh. Microscopical examination showed that the superficial layer and the mucous were composed of glandular tubules, epithelial lining, and detritus mixed with numerous red blood-corpuscles, innumerable leucocytes, and a few pus-corpuscles. The right ovary measured 2 cm. in length, 1.3 cm. in height, and 0.3 in thickness; the left was 3.5 long, 1.5 high, and 0.25 thick. These long and high but thin ovaries showed notches and puckerings, as those of a senile woman. In the left was found a freshly-ruptured follicle in the first stage of transition into a corpus luteum. Microscopical examination showed nearest the surface a zone of young follicles, and in the deeper layers much larger follicles, while the stroma was remarkable for its richness in blood-vessels compared with that of another child of the same age.

B. Arrest of Development during the First Half of Intra-uterine Life.

I. Absence of the Uterus.—It has often been claimed that the uterus was absent in cases in which such an assertion was not warranted

Fig. 80.

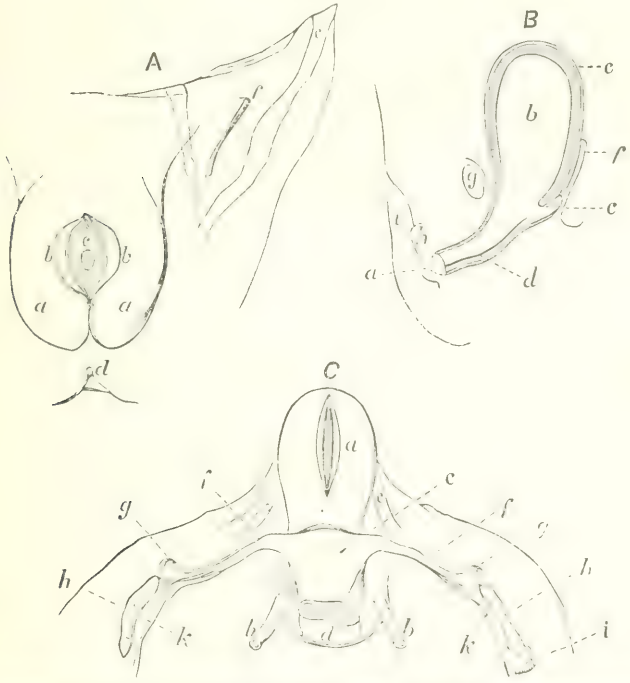


a, ribbon-shaped rudiment of the uterus; *b, b*, the round ligaments; *c, c*, Fallopian tubes; *d, d*, ovaries. (From Kussmaul, after Nega.)

by the examination. All observations which regard living persons must be eliminated, as the womb may be so rudimentary as to escape detection even by the most skilful examiner. The total absence of the womb

can only be proved by a careful post-mortem examination; and even then the observer is liable to be led astray. He must especially think of the possibility that the supposed woman be really a man with female external genitals and hidden testicles. He must furthermore distinguish a rudimentary uterus from a Fallopian tube, the limit between the two being the point of insertion of the round ligament. The com-

FIG. 81.



A, External View: *a*, *a*, the labia majora, that lay in close contact, but here are drawn asunder; *b*, *b*, the labia minora; *c*, the opening of the urogenital sinus; *d*, anus, with normal rectum; *e*, flap of skin; *f*, the external opening of the left iliac canal, from which protrudes the round ligament, which spreads in the adipose tissue. B, Sagittal Section: *a*, urogenital canal, which here almost exclusively represents the urethra; *b*, bladder; *c*, small blind pouch at the upper end of the urogenital canal; *d*, fine ridge detaching itself on both sides from the wall of the urogenital canal, and forming a rudimentary partition of the same into an urethra and a vagina; *e*, peritoneal covering of bladder; *f*, section of the flat uterus, over which the peritoneum is extended without forming any deep pouch between it and the bladder: it is bound to the bladder by means of loose connective tissue; *g*, symphysis pubis; *h*, labia minora; *i*, labia majora. C, View from the Peritoneal Cavity, behind the Uterus: *a*, bladder, incised; *b*, *b*, ureters; *c*, *c*, umbilical arteries; *d*, rectum; *e*, very flat uterus, the lower part of which has not been developed; *f*, *f*, the round ligaments, or rather horns, of the uterus; *g*, internal opening of the inguinal canal, through which the round ligaments go to the adipose tissue of the labia minora; *h*, *h*, very small and flat ovaries; *k*, peritoneal fold in which the ovaries are imbedded. (From Kussmaul, after Langenbeck.)

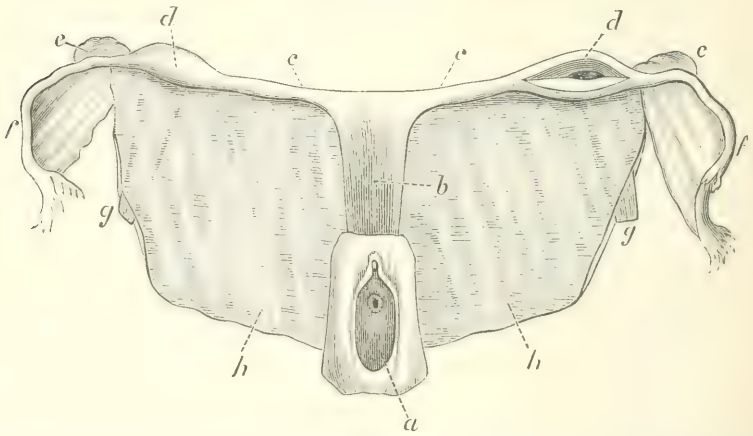
plete absence of even a rudimentary uterus is rare. In our own literature we have two cases examined post-mortem by Dr. I. E. Taylor, and there are a few other authentic cases on record.

The absence of the uterus may be found alone, but is more commonly

combined with other developmental faults of the genitals or other parts of the body. Thus in J. T. Whittaker's case, in which utero-gestation had progressed six months, the external genitals were only represented by a rudimentary clitoris; the urethra and the anus were absent, the ovaries atrophic, and the tubes devoid of fringes. In a recent case, reported by Coen of Bologna, of a girl born at eight months' gestation, the absence of uterus and vagina was combined with absence of the kidneys and deficient development of the eyeballs, while the external genitals, the tubes, and ovaries were normal.

II. Rudimentary Uterus.—The subject of the malformations of the uterus has become considerably complicated by the fact that different authors use the same term for different things or designate the same conditions by different expressions. In the following pages we will use Kussmaul's names, his work being by far the most important,

Fig. 82.



Uterus Bipartitus of a servant-girl sixty years of age: *a*, vagina, about one inch deep, and ending at the anterior wall of the rectum, above the internal sphincter; *b*, connective tissue interspersed with muscular fibres, simulating the shape of a uterus; *c, c*, fleshy strings representing the horns of the uterus; *d, d*, swellings of the size of a bean, one cut open and showing a cavity of the size of a lentil and lined with mucous membrane; *e, e*, rudimentary ovaries; *f, f*, Fallopian tubes; *g*, round ligaments; *h*, broad ligaments. (From Kussmaul, after Mayer.)

but at the same time add those used by others, and indicate when Kussmaul's terms are used by others in a different sense.

1. In some cases in the place of the uterus there has only been found a globular, solid, fibrous mass of the size of a hazelnut.

2. In Nega's case (Fig. 80) the uterus was reduced to a narrow flat muscular band, without any cavity, forming a transverse arch in the pelvis.

3. In a case described by Langenbeck (Fig. 81) the uterus is likewise formed by a solid flat, muscular mass, as in Nega's, but the mass

has the shape of the body of the uterus, and from its corners starts on either side a round string which enters the inguinal canal, and which consequently represents partly the horn of the uterus and partly the round ligament. There is no neck.

4. A transition between the solid and hollow forms of rudimentary wombs is formed by what was first described by Prof. Mayer of Bonn under the name of *uterus bipartitus*[1] (Fig. 82). This kind of rudimentary uterus is not so extremely rare as those hitherto considered, which are only represented by one or two cases. It is characterized by the presence, between the bladder and the rectum, of a body which has somewhat the shape of a uterus, and which is composed of connective tissue with interspersed muscular fibres. At the upper end it sends off to both sides a cord of similar composition, which, at the point of insertion of the round ligament, forms a small muscular swelling, which either is solid or contains a small cavity lined with a mucous membrane. These cords represent the horns of the uterus. With its lower end the fibro-muscular body rests on the cul-de-sac of a short vagina or on the solid fibrous column which replaces that organ.

The late E. R. Peaslee has described a solid uterus in the first volume of the *Transactions* of the American Gynecological Society (Fig. 83).[2] It was taken from the body of a woman twenty-four years old. "A hard conical nodule was found on introducing the hand through the abdominal incision on each side, the two meeting behind the bladder at their apices in a pretty firm mass of tissue. The finger introduced into the vagina was arrested at about three inches, and above this point to the union of the nodules above, a distance of about one and a half inches, nothing existed in the way of fibrous cords, nor the slightest canal except some blood-vessels. From the outer and anterior portion of the nodules the round ligaments were seen to be given off and to take their normal course to the internal abdominal ring." The nodules showed no cavity. The figure which accompanies the description shows that the tissue which formed the connection between the two nodules had the form of the intermediate part of a uterus, and it is stated that that likewise was solid.

The *uterus bipartitus* may have a neck. Then there are three more

[1] Lefort applies the name *uterus bipartitus* to any kind of double uterus, *uterus didactus* i. e. *didelphys*, *uterus bicornis*, and *uterus globularis* i. e. *septus*. *Uterus bipartitus* (Mayer, Kussmaul) is by others designated as *uterus bifidus*. On the other hand, the term *bifid* is by Playfair (*Science and Practice of Midwifery*, London, 1876, vol. i. p. 43) used as a synonym of *double*, and applied to a *uterus bicornis unicollis*.

The term *double* uterus is used in very different senses, and does not designate any particular kind of malformation. It ought only to be used as a general term, comprising the *uterus didelphys*, the *uterus bicornis duplex*, and the *uterus septus*.

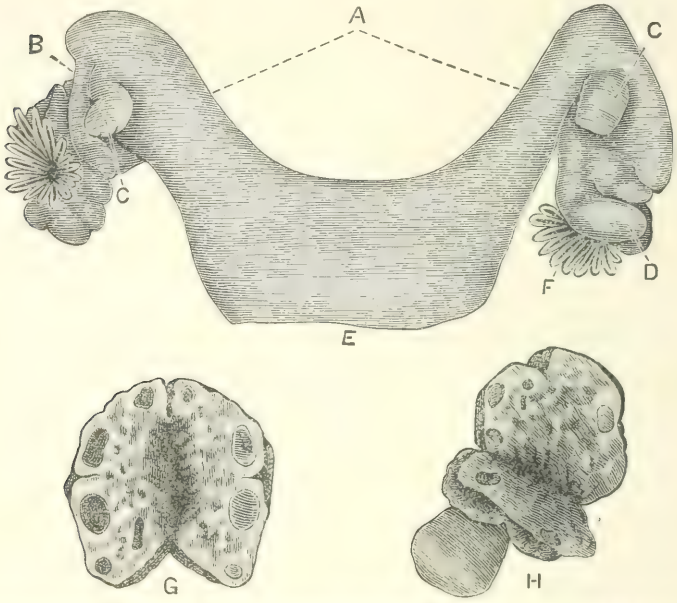
[2] *Am. Gyn. Trans.*, 1876, i. 347.

developed muscular, perhaps hollow, parts united by more membranous or cord-like parts.

5. On the other hand, there may be two well-developed horns separated by an incomplete septum, without neck (*uterus bicornis acollis*).

6. *Vesicular Uterus.*—The rudimentary uterus may only consist of a membranous vesicle with or without neck. In none of the cases of

FIG. 83.



A, the two unequal solid masses representing the cornua and part of the corpus of the bipartite uterus; *E*, the remainder of the organ, also solid, the fundus of the empty bladder lying on a level with its lower border; *C, C*, the commencement of the two round ligaments; *B*, the right Fallopian tube, the left being crossed by the line ascending from the left round ligament; *D*, stump whence the left ovary had been removed, that of the right side being behind the convolutions of the Fallopian tube; *F*, pavilion of the left tube, below the latter: the right pavilion is seen to be higher than the left, the left ovary having been one inch lower in the pelvis and farther back than usual; *G*, right ovary laid open, showing gray spots of colloid degeneration, ovisacs, and colloid cysts; *H*, left ovary, showing cysts filled with colloid, and the polypoid mass on its lower extremity—namely, a colloid cyst into which hemorrhage had occurred. (From Peaslee.)

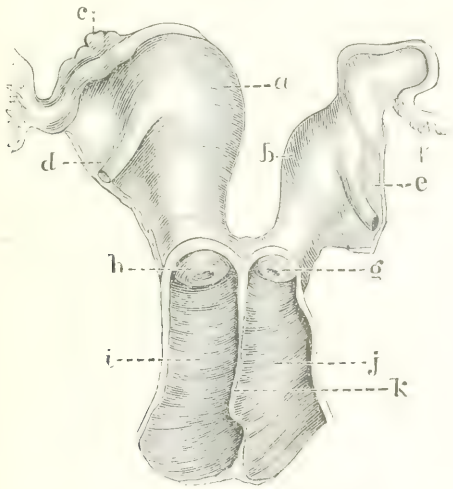
rudimentary uterus, the authenticity of which has been proved by autopsy, did the women menstruate, but they suffered often from monthly molimina, and in some few cases, in which it was impossible on the living to find any uterus, there was a periodic discharge of blood from the genitals.

III. UTERUS DUPLEX SEPARATUS, S. DIDELPHYS (δίς, twice; δελφύς, womb; *Uterus diductus*, Lefort).—This is the type produced when the Müllerian tubes do not even come in contact with one another in that part of their course in which they ought to melt together and form the

uterus. Consequently, we have two entirely separate uteri, but each of them represents only one-half of the organ. Above, it joins a Fallopian tube; below, each cervix may open into a separate vagina, or the latter organ may be more or less defective. The *uterus duplex separatus* has mostly been found in stillborn children or such as died soon after birth, but Ollivier's specimen, which we reproduce here (Fig. 84), came from a woman who was forty-two years old and had been pregnant five times. Dirner's patient was twenty-seven years old and had had one miscarriage.

In the *American Journal of Obstetrics* (1876, vol. ix. p. 651) is found a report of a case related to the New York Obstetrical Society by the

FIG. 84.



Uterus Didelphys: *a*, right cavity; *b*, left cavity; *c*, right ovary; *d*, right round ligament; *e*, left round ligament; *f*, left tube; *g*, left vaginal portion; *h*, right vaginal portion; *i*, right vagina; *j*, left vagina; *k*, partition between the two vaginæ. From Description after Ollivier.

late Dr. E. R. Peaslee, under the heading "Uterus didelphys septus and Vagina septa;" but since it is stated that "the septum ran through up to the fundus uteri," and that "the uterus was not bicornis," it is evident that this was not a uterus didelphys, but a uterus septus duplex, which will be described below.

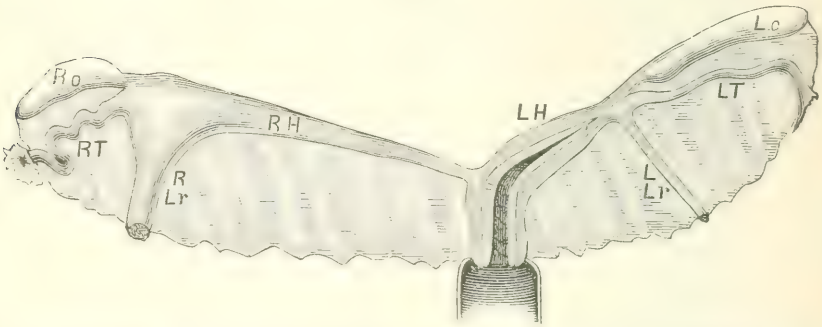
Near the uterus didelphys stands the uterus described by Cooper Rose:[1] On either side of the pelvis, resting on the rami of the ischia, were two bodies three-quarters of an inch in length, broad below and tapering above, separated from one another by a space of more than an inch, not connecting with one another or externally. The body on the left side, being cut open, was found to be one lateral portion of the uterus, having a central cavity lined with mucous membrane, and com-

[1] *Lond. Obst. Trans.*, 1874, vol. xv. p. 128.

municating at its upper end with a pervious Fallopian tube having attached to it a small ovary and terminating in a fimbriated extremity. There was no cervix or vagina to this portion. On the body on the right side existed a cervix and vagina, the latter without any external opening. This side had a Fallopian tube and ovary like the other. In this case, then, the Müllerian ducts have remained separate; the right remained imperforate at its lower end; of the left, the lower part, which should have formed the cervix and vagina, had not been formed or had been destroyed.

IV. Uterus unicornis.—The one-horned uterus (Fig. 85) is formed by the development of one of the Müllerian tubes, while the other is absent or rudimentary. The one-horned uterus is always very long in

Fig. 85.



Uterus Unicornis: *LH*, left horn; *LT*, left tube; *Lo*, left ovary; *LLr*, left round ligament; *RH*, right horn; *RT*, right tube; *Ro*, right ovary; *RLr*, right round ligament. (From Schroeder.)

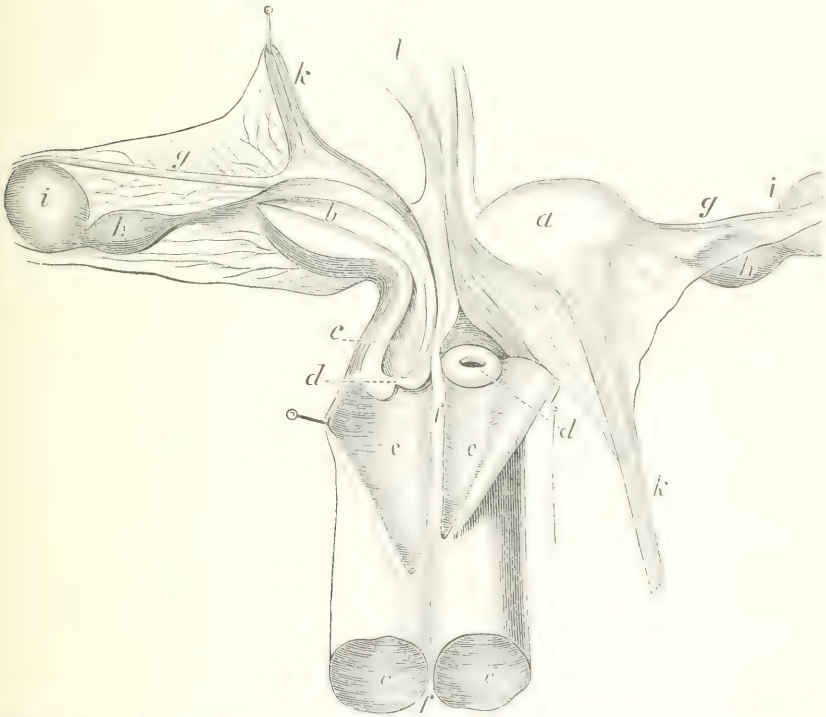
proportion to its width, forms a curve with the concavity turned outward, and ends in a point from which start a Fallopian tube, an ovarian ligament, and a round ligament. It has no fundus.

Pregnancy in a strictly one-horned uterus does not vary materially from that in a normal one. If there be a rudimentary horn, both horns develop a decidua, and a fœtus may be formed in both or in either of them. If the development takes place in the rudimentary horn, there is great danger that it will not be able to develop muscular substance enough for sheltering the fœtus through the whole normal period of utero-gestation. As a rule, the rudimentary horn is ruptured by the increasing bulk of the fœtus. Such cases may be taken for a rupture of the Fallopian tube if the observer does not bear in mind that the round ligament offers a safe landmark. If the fœtal sac is situated inside of the ligament, it belongs to the uterus; if developed outside of it, it is tubal. In very rare cases menstrual blood has been found to collect in the rudimentary horn, so as to form a unilateral hematometra.

V. Uterus bicornis.—When the Müllerian ducts stay more or

less separated from one another in that part of their course which corresponds to the upper part of the uterus, this organ is at its upper end divided into two horns. As to the lower part of the uterus, it may vary in development. In some cases there are two cavities entirely separated from one another by a partition and having each a cervix (*uterus bicornis duplex*, Figs. 86 and 87). In other cases the separation is only found in the body of the uterus, while below the

FIG. 86.



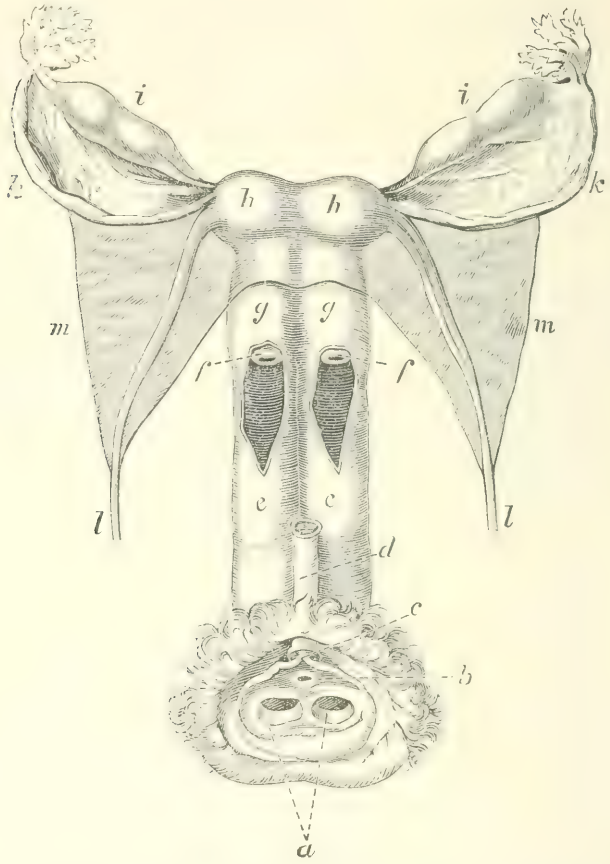
Uterus Bicornis Duplex, from a virgin thirty years old: *a*, left horn; *b*, cavity of right horn; *c*, right cervical canal; *d*, *d*, external orifices; *e*, *e*, the two vaginal canals; *f*, partition between the vaginal canals; *g*, *g*, tubes; *h*, *h*, ovaries; *i*, *i*, cysts on the ovaries; *k*, *k*, round ligaments; *l*, suspensory ligament of uterus or recto-vesical ligament. (From Kussmaul, after Cassan.)

Müllerian tubes have been fused together in the normal way, so as to form a single cervix (*uterus bicornis unicollis, s. infra simplex, s. semi-duplex*, Fig. 88).

A still smaller degree of separation is found in the form of uterus which Kussmaul calls *uterus arcuatus* (*uterus cordiformis, utérus échancré cordiforme*, Barth). On the outer surface (Fig. 89) there is only a shallow notch between the two horns, as in some forms of uterus bicornis duplex, and inside the septum is reduced to a ridge running over the fundus in an antero-posterior direction. It looks as if the

fundus had been bent inward toward the cavity in the median line, by which disposition both the whole uterus and its cavity acquire a shape somewhat like the heart on playing-cards.

Fig. 87.

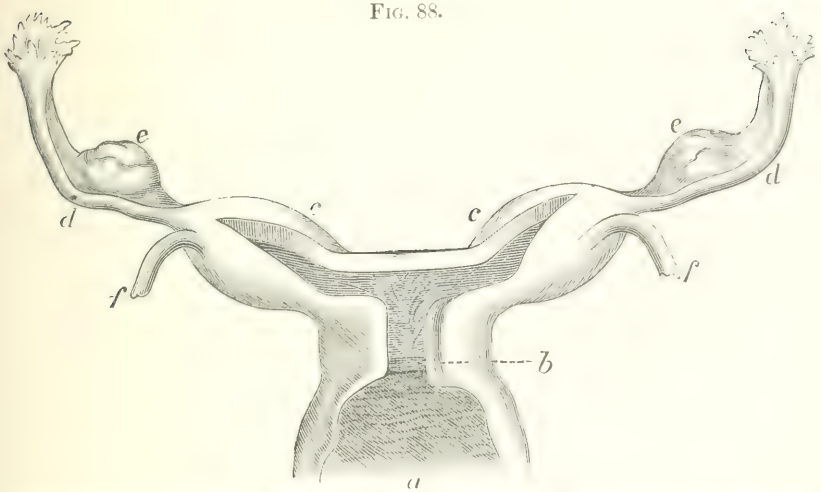


Uterus Bicornis Duplex: *a*, double entrance to vagina; *b*, meatus urinarius; *c*, clitoris; *d*, urethra; *e, e*, double vagina; *f, f*, external orifices of uterus; *g, g*, double cervix; *h, h*, bodies and horns of uterus; *i, i*, ovaries; *k, k*, tubes; *l, l*, round ligaments; *m, m*, broad ligaments. (From Kussmaul, after Eisenmann.)

VI. Uterus septus (*Utérus cloisonné*, Cruveilhier; *Uterus bilocularis*, Rokitansky; *U. globularis*, Lefort).—Much rarer than the bicornuted uteri are those which in consequence of the normal development of the fundus outwardly present the appearance of a single uterus, but in which the cavity is divided by a more or less complete longitudinal septum into two halves.

If the partition is complete, this kind is called *uterus septus*, or by redundancy *uterus septus duplex* (Fig. 90); if it is incomplete, we have a *uterus subseptus*.

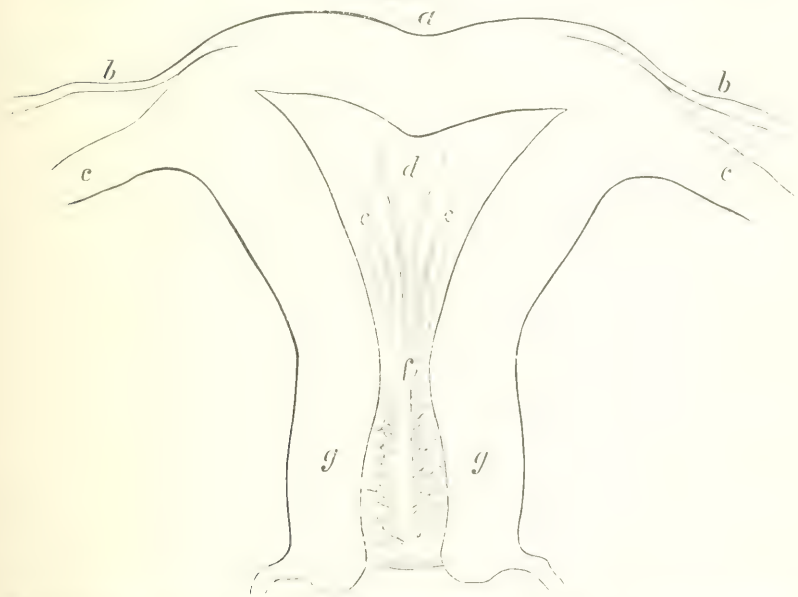
FIG. 88.



Uterus Bicornis Unicollis of a virgin: *a*, vagina; *b*, single neck; *c*, *c*, horns; *d*, *d*, tubes; *e*, *e*, ovaries; *f*, *f*, round ligaments. (From Kussmaul.)

VII. UTERUS SUBSEPTUS (*U. semipartitus*, Lefort) is a uterus which looks outside like a single uterus, but is divided internally by an incom-

FIG. 89.



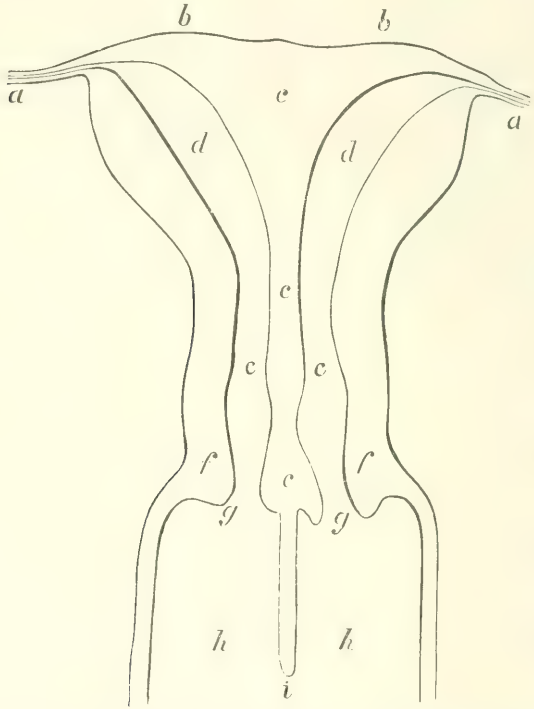
Uterus Arcuatus: *a*, indented fundus; *b*, *b*, tubes; *c*, *c*, round ligaments; *d*, central longitudinal ridge on the posterior wall of the cavity of the body; *e*, *e*, lateral ridges of the same; *f*, internal os; *g*, *g*, neck of the womb. (From Kussmaul.)

plete longitudinal partition (Fig. 91). If the partition extends down through the body and part of the cervix, so as to leave only one open-

ing at the os externum, the variety is called *uterus subseptus uniforis.* If it stops at the os internum, we have the variety called *uterus subseptus unicollis.* If it extends only partially down from the fundus through the body, that variety is called *uterus subseptus unicorporeus.* On the other hand, the septum may only be found near the os externum, thus forming a *uterus biforis supra simplex.*

A peculiar variety standing very near the last one is that observed by "a Western physician," and reported to the New York Obstetrical

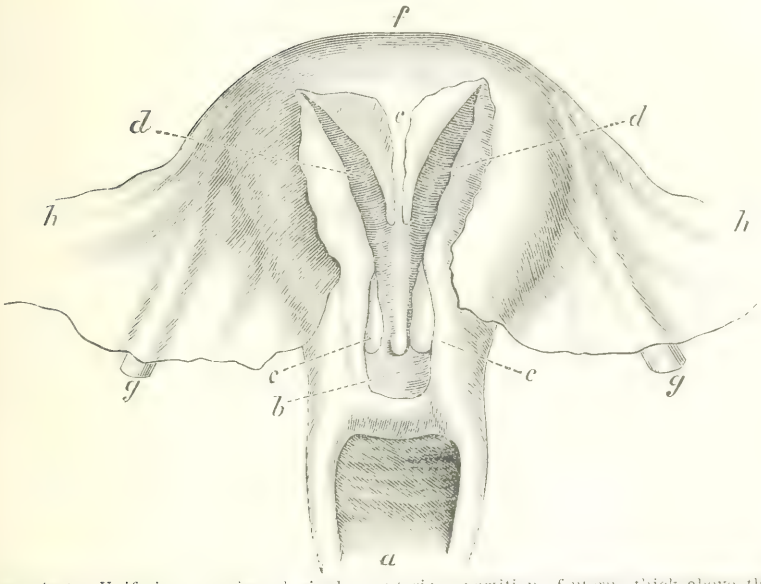
FIG. 90.



Uterus Septus Duplex (natural size), completely double uterus and incompletely double vagina of a girl twenty-two years old: *a, a,* tubes; *b, b,* fundus of the double uterus; *c, c, c,* partition of uterus; *d, d,* cavities of the uterine bodies; *e, e,* internal orifices; *f, f,* external walls of the two necks; *g, g,* external orifices; *h, h,* vaginal canals; *i,* partition which divided the upper third of the vagina into two halves. (From Kussmaul.)

Society by Dr. P. F. Mundé. The patient was a woman of middle age who had been married ten years. She was treated for leucorrhœa, and a discrepancy between her statement about the continuance of the discharge and the doctor's own observation that the cervix got well under appropriate treatment, led to the discovery of a second and narrower vagina leading to another cervix. By means of two sounds the doctor convinced himself that the septum in the vagina was complete, and that it extended somewhat into the cervix, while there was no trace

FIG. 91.



Uterus Septus Uniforis: *a*, vagina; *b*, single os uteri; *c*, partition of uterus, thick above, thin below; *d*, *d*, right and left uterine cavities; *e*, *e*, two ridges on the posterior wall of the cervix. (From Kussmaul, after Gravel.)

of a septum in the body of the uterus (Figs. 92 and 93). This form differs from the uterus subseptus biforis by the presence of two vaginal

FIG. 92.

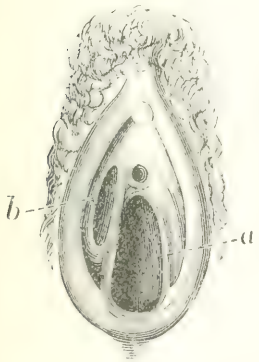


FIG. 93.

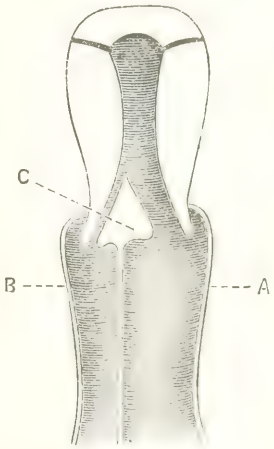


FIG. 92.—*a*, left vaginal entrance; *b*, right vaginal entrance.

FIG. 93.—Ideal Section, showing double vagina and neck, single body; *A*, left vagina; *B*, right vagina; *C*, partition dividing the neck of the womb.

portions. As the woman had borne a child by a premature birth at the sixth month, there may possibly have been a complete septum which

was destroyed during labor. In M. Duncan's case of uterus subseptus the cervix was single, and the "firm septum of the uterine cavity ended at its upper part in a smooth, broad-edged end." Thus there must have been a free space between the septum and the fundus; and since its end was smooth and broad, that means, probably, that it had not been torn during the preceding delivery.

In all forms of double uterus, be it horned or not, the vagina may be single or double. If there is a double vagina, there commonly is a *vaginal portion* in each half. Exceptionally, there is only one prominence, divided internally by a septum. Sometimes there is one cervical portion opening with two openings into one-half of the vagina, the other half ending blind superiorly; which cannot be explained as a simple arrest of development, but constitutes an irregularity. In a case described by Cruveilhier there was a single vagina with a single vaginal portion.

In women with double uterus the menstrual flow comes sometimes from both halves of the uterus, sometimes from one only; and if it comes from both, it may come at different times from the two halves (Kussmaul). In the case of the "Western physician" mentioned above a specular examination performed during menstruation showed that the discharge came from both orifices of the uterus at the same time. Dr. T. A. Emmet[1] has reported a case of double uterus and double vagina, with imperforate hymen on one side, in which there never was a show at less than two months' interval. The doctor, therefore, thought it likely that the patient menstruated from the two uteri alternately. Dr. H. F. Walker has described[2] the case of a woman with uterus septus, double vagina, and double vaginal portion. In this case menstruation recurred every two weeks. It is therefore possible, although not proven, that both halves had a monthly period, but at different times. Dr. John Aikman's case is conclusive, since it afforded the opportunity of a post-mortem examination. The patient died at the end of menstruation. She had a double uterus and vagina. The mucous membrane of the left cavity was covered with a grayish shreddy structure and opaque mucus, but the membrane itself was firmly adherent and in no part absent. That of the right was quite unaltered. In the left ovary was found a dark-colored granular clot, which had evidently been a Graafian "vesicle;" that is to say, it was a ruptured Graafian follicle filled with a blood-clot. In this case, then, evidently only one half of the uterus was implicated in the menstrual process.

Pregnancy occurs in a double uterus as easily as in a single. One or both halves may become the seat of development of a fœtus. Even if the pregnancy is limited to one side, as a rule the other side participates more or less in the development during gestation, increasing in

[1] *Trans. Am. Gyn. Soc.*, vol. ii. p. 444. [2] *Am. Journ. Obstetrics*, vol. viii. p. 515.

size, producing new muscular tissue, and forming a decidua. In some cases the os opens on both sides during labor, in others not. The following case came under my personal observation: C. Y——, æt. 20, primipara. The first menstruation occurred when she was thirteen years old. She had a complete septum of the vagina extending in the median line from the vulva up to the uterus. The two halves of the vagina were of the same size, and led each to a vaginal portion. She was delivered at term of a male child weighing six pounds eight ounces. The child presented by the breech in the left os. In the beginning of labor both mouths dilated, that of the empty right side even more than the other, but later in labor the right stayed at a dilatation of an inch in diameter, while the left became fully dilated. The labor lasted seventeen hours and three-quarters, fifteen of which came on the first stage, two and a quarter on the second, and half an hour on the third. The scrotum having become discolored, the child was easily extracted manually. During parturition the vaginal septum was torn up to a quarter of an inch from the uterus, and ten days after confinement nothing could be felt of it. The interior of the womb was not examined; the external configuration was that of a normal single uterus.

The much-vexed question of *superfœtation* lies beyond the scope of this work. Suffice it here to say that the presence of a double uterus would materially facilitate such an occurrence, for the idea prevailing until quite recently, that ovulation ceased during pregnancy, has been proved to be erroneous, and the conditions of the unimpregnated side of the uterus are such that even after the third month, at which period superfœtation is absolutely impossible in a single uterus on account of the development of the ovum, such an event might occur in it.

It has been noticed in several instances that women with a double uterus were uncommonly broad of face and body, showing a similar disposition to lateral extension in the rest of the body as in the uterus.

VIII. Atresia uteri.—In very rare cases the uterus has been found closed at its lower end. The occlusion may be seated at the os, and be due to the mucous membrane of the vagina, which covers the vaginal portion totally, without leaving any hole open. In other instances the occlusion is found in the cervix itself, which may be totally impermeable, a muscular tissue identical with that of the surrounding parts being found where normally the canal is situated. In the latter case the vaginal portion is small or absent. Atresia has been found in a two-horned uterus.

Menstruation and conception are of course impossible. By being pent up the menstrual flow gives rise to a distension of the womb

formed of blood (*hæmatometra*[1]), which may be changed to pus (*pyometra*[2]), or instead of blood a mucous fluid may collect (*hydrometra*[3]). If the atresia affects a two-horned uterus, one or both horns may be occluded, and consequently the fluid collect in both sides or only in one.

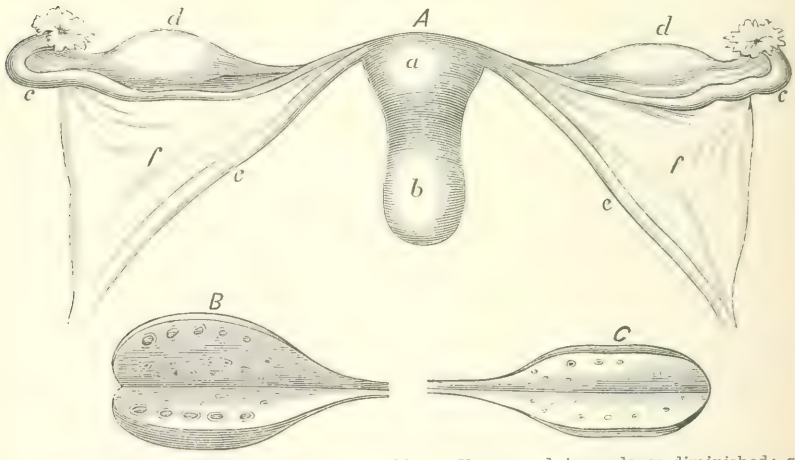
The explanation of the occurrence of congenital atresia of the cervix as a malformation presents no difficulty when we remember that the uterus is formed by the fusion of the Müllerian ducts, and that these at their first appearance are solid.

C. Arrest of Development during Second Half of Intra-uterine Life, or After Birth.

All the forms of arrested development hitherto considered are referable to the first half of gestation. An arrest at a later period gives rise to less marked variations from the normal type. To this group belong the fœtal, the infantile, and the pubescent uterus.

I. Uterus fœtalis and Uterus infantilis.—Several observations at post-mortem examinations of adult women have revealed the pres-

Fig. 94.



Infantile Uterus of a girl twenty-one years old: A, Uterus and Appendages diminished: *a*, body; *b*, neck; *c*, *c*, tubes; *d*, *d*, ovaries; *e*, *e*, round ligaments; *f*, *f*, broad ligaments. B, right ovary cut open longitudinally, showing large Graafian follicles. C, left ovary with smaller follicles. (From Kussmaul.)

ence of a uterus which not only in size, but in configuration, corresponded to that normally found in the fœtus toward the end of pregnancy or in young children (Figs. 94, 95). Sometimes it measured only an inch or an inch and a half in length. In other cases it attained the length

[1] *αἷμα*, blood; *μήτρα*, womb.

[2] *πύον*, pus; *μήτρα*, womb.

[3] *ὕδωρ*, water; *μήτρα*, womb.

of a virgin uterus, but characteristic were the preponderance of the neck over the body and the thinness of the walls. Internally the folds of the arbor vitæ were either confined to the cervix or extended more or less up into the body of the womb (Fig. 95). Women with such a uterus rarely menstruate, and cannot conceive, although they may have sexual appetite and be well fit for copulation.

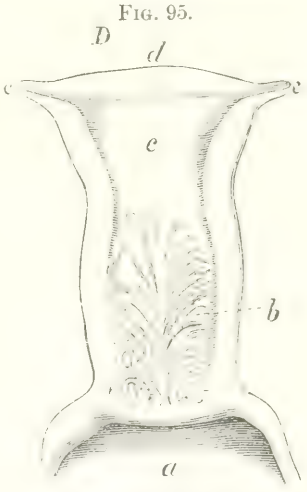


Fig. 95.

Coronal Section of the same Uterus as in Fig. 94, natural size; *a*, vagina; *b*, neck with arbor vitæ; *c*, body; *d*, fundus; *e*, *e*, internal ends of the tubes.

The *uterus fœtalis* may at the same time be *bicornis* as the result of a double arrest of development.

The following case of infantile uterus has come under my personal observation. It concerned a woman thirty-six years of age who had been married six years and never been pregnant. Her courses had begun when she was twenty years old, and had been painful and very scant. She had never felt any sexual appetite, although coition did not cause pain, except when performed shortly after menstruation. Before marriage she was chlorotic and had much leucorrhœa. Vaginal examination revealed a somewhat smaller and rounder os than normal. The cervix was thin, but about of normal length, whereas the body was only represented by a small swelling like a little finger which could be felt both in front and behind. The depth of the whole uterine cavity from os to fundus measured only 4 centimeters ($1\frac{5}{8}$ inches), leaving about 1 centimeter for the cavity of the body.

II. Uterus pubescens.—Puech gave this name to a class of uteri which are conformed like that of the young girl immediately before puberty, and especially characterized by their small weight, which does not exceed an ounce, whereas the normal uterus averages an ounce and a half. The cervix and the body have about the same length.[1] Menstruation is absent or scanty and irregular, and women with so small a uterus are commonly sterile. Still, a late development may take place, and they may bear children.

III. Uterus incudiformis,[2] s. biangularis.—The anvil-shaped

[1] Even in the adult nulliparous woman the cavity of the neck is, according to Sappey (vol. iii. p. 664), longer than that of the body, the dimensions being, on an average, in nulliparous women, the whole cavity, 52 millimeters; the neck, 25; the isthmus, 5; the body, 22; in multiparous women, the whole cavity, 57 millimeters; the neck, 24; the isthmus, 5; and the body, 28. Others, throwing the isthmus together with the body, come to the opposite conclusion (Kussmaul, p. 18).

[2] *Incus*, Latin, anvil.

uterus (Fig. 96) is well developed in other respects, but the deficient bulging of the fundus, which forms almost a straight line from one Fallopian tube to the other, and the abrupt transition from the neck to the body of the womb, give it the shape of an anvil, and reminds us of a uterus from the fourth or fifth month of gestation.

FIG. 96.

Uterus Incudiformis. (From Kussmaul, after Oldham.)

IV. UTERUS PARVICOLLIS AND ACOLLIS.—The body of the uterus may be well shaped, but the neck, or at least the vaginal portion, rudimentary or absent.

In other cases there obtains smallness of the uterus, with specially defective development of the neck.

V. ANTEFLEXION is often congenital, and as long as there is only an even and moderate curvature it may be regarded as a continuation of the shape of the uterus in the fœtus and in young children.

D. IRREGULAR DEVELOPMENT.

The forms so far considered were all reducible to an arrest of development. In others we must admit a true divergence from the normal type.

1. OBLIQUITY.—There may be a congenital crookedness of the womb itself, or an otherwise well-shaped uterus may be misplaced. The former condition is attributable to an uneven development of the two Müllerian ducts, which combined go to form the uterus. Thus a *congenital lateroflexion* is produced. A similar result may be due to fœtal peritonitis, with cicatricial shrinkage of the broad ligament on one side.

A well-shaped uterus may be tilted over to one side, especially where there is a beginning ovarian hernia.

II. LATEROPOSITION.—It is not rare to find in the adult the womb well shaped, but placed with its axis parallel to the median line instead of lying in the same. This lateroposition, when it is not due to previous inflammation and cicatricial shrinkage, is referable to an uneven development of the broad ligaments.

III. ANTEPOSITION, AND IV. POSTPOSITION—that is, the placement of an otherwise normal womb too far forward to the symphysis or too far back toward the sacrum—are probably due to similar irregularities in the development of the surrounding parts.

V. Hernia uteri.—The uterus has been found in a congenital inguinal hernia. This irregular position is due to a complete descent of the ovary like that which is normal for the genital gland of the other sex. The womb is then pulled along until it enters the hernial sac. In this unwonted place it has even become impregnated, and been subjected to Cæsarean section.

VI. Abnormal Communications.—The uterus has been found forming one sac together with the bladder and the vagina. It has likewise been found communicating with the bladder or the colon ascendens or the rectum. In a case described by Doran the right side of a uterus bipartitus opened on the outer surface of the body.

The Vagina.

The vagina being originally one with the uterus, its malformations are in many respects similar. It may be more or less completely closed by a transverse septum; it may be divided by a longitudinal septum; it may be too narrow, or it may have faulty communications with other cavities.

Atresia vaginæ.—The word "atresia" is often used by authors in a loose way in speaking of cases in which the vagina was closed by a septum with a narrow opening. The etymology of the word, from *a* privative, and *τράω*, to bore, teaches that it ought only to be applied to an unbored—that is, absolutely closed—vagina. Where the menstrual flow can find an outlet and spermatozoids an entrance the term atresia is not appropriate, but ought to be replaced by *stenosis*.[1]

Sometimes the atresia is only produced by a membrane forming a transverse partition in the vaginal canal. The most common kind of this deformity is that in which the hymen closes the whole entrance (*atresia hymenalis*). It is commonly stated that the hymen is formed about the end of the fifth month of gestation. If that is correct, the atresia hymenalis would be an overgrowth ending in the transformation of the hymenial valve to a complete circle; but perhaps atresia might be due to a fusion of the originally solid Müllerian ducts at their lower end, and the persistence of this solid membrane without the formation of an opening.

Breisky has found the vagina closed in newborn children by a thin membrane situated just above the hymen (*septum retrohymenale*).

A more solid transverse septum is found in adults about an inch above the entrance of the vagina or nearer the upper end. Sometimes a more extensive atresia has been found in the middle between a normal upper and lower part of the vagina. As many as three or four

[1] Στενός, narrow.

transverse septa have been found placed one above the other and separated by different kinds of retained fluid.

Finally, the whole canal may be absent—a condition which commonly is combined with absence of the uterus; but in other cases a normal uterus is found beyond the closed vagina. A case in which the former condition seemed to obtain has come under my personal observation, and was reported to the New York Obstetrical Society (October 7, 1884). The patient was twenty-one years old and had been married ten months. She had never menstruated, but had had monthly molimina for the last two or three years. She had sexual desire, but had never had any satisfaction. She complained of headache every few days, general weakness, and slight constipation. She was strongly built, had well-developed breasts, an uncommon abundance of black pubic hair blending with a rich growth of hair around the anus. The urethra and the rectum were perfectly normal. So were the large and small labia; but there was no vagina. In its place, just behind the meatus urinarius, close up to the median line, were found two round depressions, one on either side. The left admitted a probe to the distance of one-quarter of an inch; the right one was imperviable. These two recesses were evidently remnants of the Müllerian ducts. Behind them the fossa navicularis yielded easily to pressure, so as to admit a finger to the depth of one and a half inches. This pouch was the place in which coition took place, and had probably been expanded considerably by the act itself. There was no tumor over the symphysis. In spite of a very careful examination with the index in the rectum, a sound in the bladder, and the other hand on the abdomen, no trace of a uterus or ovaries could be felt.

In Gomer Davies's case atresia of the vagina was combined with a cyst formed by distension of its upper part. It was found in a newly-born child, in whom it occupied most of the abdomen. It contained about six ounces of a clear fluid, with grumous deposit at the bottom. The uterus sat at the upper part of the cyst, communicating with it.

Complete atresia excludes menstruation, and may give rise to the accumulation of blood (*hæmatocolpos*) or pus (*pyocolpos*) in the vagina above the septum or in the uterus. Atresia prevents impregnation, and renders a normal connection difficult or impossible. If there is only a transverse septum in the upper part of the vagina, the relations approach the normal condition. If it is situated near the lower end or at the entrance, the pouch may in course of time become considerably deeper. Sometimes connection takes place in one of the neighboring openings, the urethra or the anus, especially the former. The urethra is in some women very easily dilatable. I examined once an intact virgin in whom the entrance had not been made easy by masturbation, as often is the case, and I was much surprised to find that my index,

although not exercising more than a very moderate pressure, had penetrated into the bladder. Retracing my steps, I found much more resistance in entering the vagina, although this organ proved to be entirely normal. This is probably a rare condition: I at least have only met with this single case. But by repeated attempts at coition in cases of occlusion of the vagina the urethra becomes often gradually dilated, so as to admit the male member; and, strange enough, this considerable dilatation results only exceptionally in incontinence of urine. As a rule, it does not give rise to any such trouble.

Much more common than complete atresia are the cases of *stenosis* produced by a more or less complete septum with one or more openings. Such an opening is sometimes so small that it can only be discovered at the time of menstruation, when perhaps softening takes place; and, at all events, the blood trickling through the opening leads to its discovery. Even under so unfavorable circumstances spermatazoids may work their way into the interior of the womb and pregnancy take place. The membrane will then, of course, form an obstruction to delivery, and require operative interference, as in the cases of I. E. Taylor, J. S. Coleman, F. Barnes, Heywood Smith, and others.

Different theories have been proposed for explaining the occurrence of a transverse septum in the vagina. One is that after the Müllerian ducts had been perforated, and had been fused together into one canal, an agglutination and coalescence took place between the two walls. According to another, the septum is looked upon as a remnant of the originally solid filaments, which have coalesced, but failed to be tunnelled at the seat of the membrane. Finally, where there is only one more or less thick septum, it may be that the canal above the septum belongs to one Müllerian duct, and that below to the other.

Double Vagina.—Like the uterus, so the vagina may be divided into two halves by a longitudinal partition. It is composed of two layers of mucous membrane and intervening muscular tissue. It may be complete or incomplete. In the latter case it may be found in the upper part or in the lower or in the middle, or be perforated by one or more holes.

When the vagina is double the uterus is commonly so too, but in rarer cases a double vagina may correspond to a single uterus. One-half of the vagina is often more developed than the other. Where there is a one-horned uterus combined with a double vagina, that side which corresponds to the atrophied or absent uterine horn remains rudimentary. Sometimes there corresponds only one-half of the vagina to a one-horned uterus, the other half being absent altogether. In this case the vagina is very narrow.

When a double vagina corresponds to an entirely double uterus (*bicornis duplex* or *septus*), as a rule there is a separate vaginal portion

in each half of the vagina. As we have seen above, there has exceptionally been found a single cervical portion with two openings in one half of the vagina and none in the other. One-half of the vagina may be too narrow for coition, and the one that is used may end as a cul-de-sac without communication with the womb.

Instead of a more or less complete vaginal septum, there may only be found a band uniting the anterior with the posterior wall in the median line. I have seen such a case myself, in which there was a fleshy band as thick as a finger just below the vaginal portion. As it obstructed labor, I cut it with scissors. There was no bleeding. In another case under my care the husband complained of some obstruction to the introduction of the penis. On examination I found on the left side of the upper half of the vagina a septum one and a half inches high and three-quarters of an inch wide. Between it and the vaginal wall there was a free passage. This septum was likewise cut with scissors, which gave rise to some little hemorrhage. As the lady had borne a large child before, and the dyspareunia had appeared after the birth of the child, it is not unlikely that this septum was only a remnant of a more complete one which had been partially destroyed during parturition.

Double vagina may be combined with atresia on one or both sides, and thus unilateral or bilateral hæmatocolpos or pyocolpos may be produced.

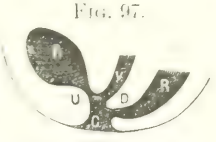
Stenosis, or narrowness of the vagina, may, as we have seen above, be due to the presence of an incomplete transverse septum, or to the vagina being really only half a vagina. By an arrest of development in childhood and later it may likewise stay narrow—a condition which sometimes is combined with the insufficient development of the uterus described above as *uterus fœtalis* and *uterus infantilis*.

Blind Canals.—Immediately above the entrance to the vagina, on one side of the columna rugarum, are sometimes found openings leading into canals lined with mucous membrane, but with smooth walls extending upward parallel to the vaginal wall or deviating into the perivaginal connective tissue. They may be an inch and a half long and thick enough to admit the little finger. The upper end is closed. These canals are supposed to be uncommonly-developed lacunæ of the mucous membrane. They differ from a secondary vagina by their thin and smooth wall, and sometimes by their direction (Breisky).

Faulty Communications.—When we remember that at an early stage of fœtal development there is a common cloaca in which end the urinary and genital canals, as well as the rectum (see Fig. 2, p. 69; Figs. 31 and 32, p. 89), it is easy to understand how by an arrest of development faulty communications may be found between the different passages.

Normally, the rectum is separated from the sinus urogenitalis by the formation of a septum which is completed in the tenth week. If this is not formed, the rectum will apparently open into the vagina, and there will be atresia ani—a condition which has been designated by the strange name of *atresia ani-vaginalis*. What has been taken for the vagina is really the cloaca, which has not been divided into a rectal and a urogenital part (persistent cloaca, Fig. 97). Sometimes the opening of the rectum has a sphincter, so that the individual may retain the feces voluntarily. This apparent communication with the vagina is not very rare. Dr. J. H. Pooley of this city has compiled 38 cases.

Fig. 97.



Persistent Cloaca: *C*, cloaca; *D*, partition which ought to have formed the perineum; *R*, rectum; *V*, vagina; *B*, bladder, *U*, urethra. (From Schroeder.)

In other cases it is the genital canal which seems to open into the normally-formed rectum. The celebrated French surgeon Louis has reported the case of a girl whose genitals were imperforate. She menstruated through the anus, and through the same opening coition took place, and, finally, a child at full term was born that way. In this case either the vagina or the uterus must have opened into the rectum. It is not stated where the urethra opened, but there can scarcely be any doubt that that organ likewise opened inside of the only opening present.

A similar faulty communication may take place between the vagina and the bladder or the urethra. At first the sinus urogenitalis appears as a continuation of the bladder, but in consequence of the growth of the uterus and the vagina in the sixth month, and the comparatively slow development of the sinus urogenitalis, it appears finally as the continuation of the vagina, forming the vestibule into which the urethra opens (Fig. 33, p. 90). Some cases present an appearance as if the urethra did not open into the vulva, but into the vagina itself. A closer examination will, however, reveal that this condition is due to an uncommon depth and narrowness of the sinus urogenitalis, so that what appears to be the vagina is really the vestibule (persistent sinus urogenitalis; Fig. 98).

Fig. 98.

Persistent Sinus Urogenitalis: *C*, hypertrophic clitoris; *B*, bladder; *U*, urethra; *V*, vagina; *S*, sinus urogenitalis; *R*, rectum. (From Schroeder.)

In Palfyn's case there was one sac, into which opened a uterus didelphys and the intestine.

In cases of extroversion of the bladder the vagina, as well as the ileum and the colon, have been found to open on the exposed mucous membrane. In Lebedeff's case there was a congenital vesico-vaginal fistula combined with hypospadias.

W. H. Baker of Boston has described and successfully operated on a case in which the left ureter opened into the vagina, instead of being connected with the bladder.

The Hymen.

The hymen is not, as stated in most anatomical textbooks, a semilunar fold of the mucous membrane placed at the entrance of the vagina. It is now, as stated above, looked upon as being the whole lower end of the vagina, and its shape varies very much. As a full knowledge of the normal shape of the hymen is of great practical value in legal questions, we will give some details on this subject. Tardieu, who has examined more than 600 cases with special reference to the hymen, admits five normal conformations, which he places in the following order of decreasing frequency:

Fig. 99.

1. The hymen consists of a strip of tissue bent at the lower end so as to form two lateral lips, touching one another in a vertical line; which shape is almost constantly found in childhood, and sometimes yet after puberty (Fig. 99, from Tardieu). 2. The hymen forms an irregularly circular diaphragm with a more or less large opening in the anterior third (*hymen annularis*).[1] 3. The diaphragm is exactly circular, with a central circular opening (*hymen circularis*). 4. The diaphragm is crescent-shaped, with a concave border turned forward, and two horns ending on the inside of the labia minora (*hymen semilunaris*).[2] 5. The hymen is only represented by a low circular or semilunar ridge. Besides these normal shapes the hymen presents several abnormalities. According to Dohrn, an intact hymen may present indentations. In the *hymen denticulatus* the edge does not form one smooth line, but is divided into many prominences by short nicks. It is distinguished from a ruptured hymen by the softness of the edge, the round contour of the prominences and recesses, and the absence of cicatricial tissue. The *hymen fimbriatus* has the edge split into a fine fringe, due to papillary hypertrophy, but similar growths are then found on the surfaces of the hymen, on the labia minora, and round the urethra.

It is doubtful if the hymen is ever absent. At least Tardieu has never seen a case in which there were not distinct remnants of it, but the last-mentioned shape, where the hymen is reduced to a scarcely prominent ring, can easily be mistaken for total absence.

Atresia hymenalis.—The hymen may form a completely closed septum. This condition, like that of the presence of a diaphragm higher up in the vagina, will cause retention of the menstrual flow as a tarry mass (*hæmatocolpos*), or the accumulated fluid may suppurate (*pyocolpos*).

[1] *Annulus*, ring.

[2] *Semi*, half; *luna*, moon.

Abnormal Openings.—In other cases the hymen has two round or lengthy openings (*hymen bijoris*[1] or *bifenestratus*).[2] If the openings are large and the intervening tissue narrow, the case is called *hymen septus*. Sometimes the partition grows out from the anterior and posterior circumference, but without joining in the middle (*hymen subseptus*).

The hymen may likewise be perforated by many small openings (*hymen cribriformis*).[3]

Fleshy Hymen.—The normal hymen consists of a double layer of mucous membrane with an intermediate layer of muscular fibres and many blood-vessels. In abnormal cases this intermediate layer may become so much developed as to present a serious obstacle to connection.

Double Hymen.—The hymen may be said to be double in different senses. Sometimes it is composed of two diaphragms placed one above the other, but the upper one in such cases is probably a transverse septum near the lower end of the vagina. Sometimes this condition is due to accumulation of mucus above the hymen, producing a dilatation of the lower end of the vagina, limited above by a constriction, at the seat of which the second hymen is developed.

Where the vagina is double there is generally a hymen in each half, but often the lower part of one-half of the vagina may be absent, so that the canal ends blind without any hymen. Such a condition will give rise to the formation of a lateral collection of blood or other fluid.

Finally, the hymen alone, in an otherwise single vagina, may be separated in two by a septum running in an antero-posterior direction. (See *Hymen septus*.)

Congenital Cysts.—Barstellberger has described a cyst of the size of a lentil in the hymen of a newborn girl. Microscopical examination showed that it had been formed by invagination from the epithelium on the vulvar side of the organ.

The Hymen in the Negro Race.—Is there any difference between the white and the black woman as to the place of the hymen? Dr. E. B. Turnipseed of Columbia, S. C., asserted some years ago that the hymen in the negress was situated from one and a half to two inches "above the entrance of the vagina." He gave the details of nine cases, seven of which were in children eight to twelve years old, in whom the distance was from a half to three-quarters of an inch above the entrance. This assertion was corroborated by Dr. C. H. Fort of Adams Station, Tennessee. He gives six cases. It is claimed that the hymen in these cases was situated one or two inches "within the vulva." The latter author claims likewise that the hymen of the

[1] *Bis*, twice; *foris*, door. [2] *Fenestra*, window. [3] *Cribrum*, sieve.

negress is of greater density than that of the white woman. He thinks that these two features, the high position and the unusual density, "would enable any practised physician to distinguish the negro from the white race, even in the dark, by aid of touch alone." On the other hand, Dr. H. O. Hyatt of Kinston, N. C., claimed to have examined a thousand negro women without remarking any difference between the two races in regard to the vagina and hymen. He thinks the assertion of Dr. Turnipseed is based on a confusion of the rectilinear rima pudendi and the round orificium vaginæ. I have no personal experience on this question to offer. Dr. Hyatt is right, that the lower and upper openings of the vulva are very often confounded, as I have pointed out myself in the anatomical remarks forming the introduction to my paper on the "Obstetric Treatment of the Perineum;" but even if the two above-named observers should have made this mistake, that could not account for much more than one inch, and by no means for the distance of two inches which they claim in some cases. Besides, it is not likely that they would claim as a peculiarity for the negro race what they could scarcely be otherwise than familiar with in the white race. If their observation is correct, the explanation can only be that the sinus urogenitalis is deeper in the black race. It would be very desirable that Southern practitioners, who have a larger field of observation in this regard than we who live in the North, warned as to the possible mistake pointed out, would pay attention to this interesting anthropological question, and give us a large number of exact observations of the seat of the hymen in the negro woman.

As to the theory of the malformations of the hymen, it must be remembered from the section on Development (p. 92) that this organ is formed late in fœtal life, beginning in the nineteenth week, at a time when the Müllerian ducts long ago have opened into the sinus urogenitalis and been fused together into one canal. The atresia of the hymen can therefore not be explained as an arrest of development, like that which obtains when the same condition is found higher up in the vagina or in the uterus, but it must be looked upon as an excess of growth. Nor can the double hymen simply be taken as an arrest of development of the hymen itself, but must be regarded as an arrest of development of the lower end of the Müllerian ducts, by which there stays two openings, and the subsequent development of a hymen in each of them. Multiplicity of openings must be looked upon as the result of an irregular growth.

The Vulva.

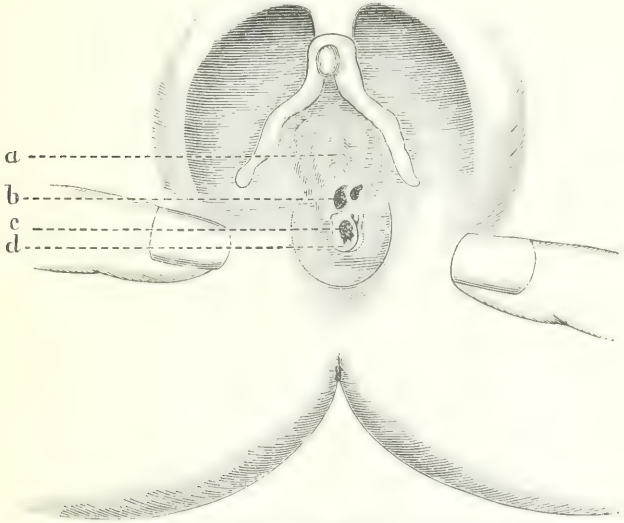
Absence of Vulva.—The whole of the external genitals, together with the anus, may be absent, a continuation of the skin without any

openings occupying their place. This condition is due to an arrest of development at the very earliest period of fœtal development, before the appearance of the cloacal opening in the fourth week. It is almost always combined with an arrest of development in other organs, and is only found in non-viable fœtuses.

In other cases there is an anus, but the vulva has not been formed, the genital furrow having not become deep enough to open into the sinus urogenitalis.

Hypospadias.[1]—When the posterior wall of the urethra is defective the condition is called hypospadias (Fig. 100). If the defect extends far up, the control over the bladder is lost.

Fig. 100.



Hypospadias: *a*, open canal, formed by the anterior wall of the urethra, the posterior being absent in this part; *b*, posterior, closed part of the urethra; *d*, hymen; *e*, opening in the same. (From Winckel, after Mosengeil.)

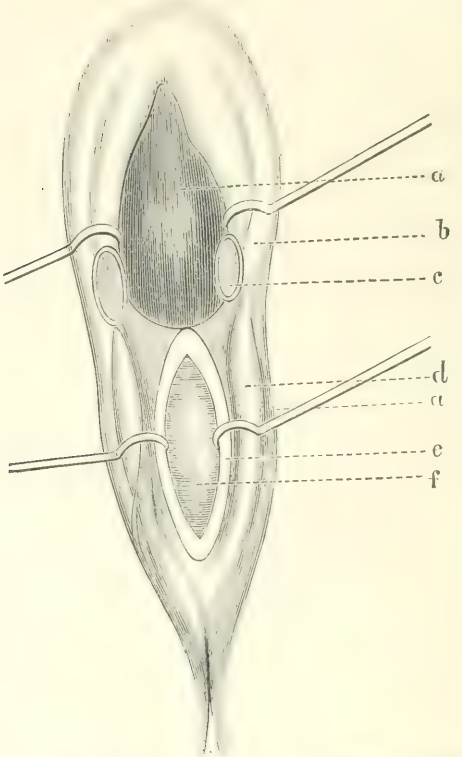
Epispadias[2] is the name for a condition in which there is a cleft in the anterior wall of the urethra, which mostly is combined with a cleft in the anterior wall of the bladder (*extroversio vesicæ*). In the upper part of the vulva, just below the symphysis pubis, appears the mucous-membrane of the open bladder (Fig. 101). There is no urethra. The clitoris may be cleft.

The urethra forms originally one organ with the bladder. Both are a development of that part of the allantois which is situated inside of the fœtus. Thus this cleavage is not a simple arrest of development, but is attributable to a deficiency of the anterior wall of the bladder, as well as to an arrest of development in the abdominal wall.

[1] Ὑπὸ, under; σπαδίζω, I tear.

[2] Ἐπὶ, on; σπαδίζω, I tear.

Fig. 101.



Epispadias: *a*, fissure in the bladder; *b*, labium majus; *c*, clitoris; *d*, labium minus; *e*, hymen; *f*, vaginal entrance. (From Winckel, after Kleinwächter.)

The clitoris has been found cleft, without any cleavage of the urethra or bladder, but combined with a cleft symphysis and a deficiency in the abdominal wall above the bladder.

Other Congenital Abnormities.

The *clitoris* may be absent, rudimentary, or, on the other hand, very much enlarged. Hyrtl states that in some African tribes the clitoris hangs down, covering the rima pudendi as a valve, and that the people fasten it with a ring to the perineum as a protection for virginity. In hermaphrodites it often becomes as large as a penis of moderate dimensions. Bainbridge found in a woman whom he assisted in labor a clitoris about five inches long and of the diameter of a quiescent penis of an adult, to which organ it became still more like by the presence of a groove behind the glans. At a later examination it was found measuring three inches in length and two in circumference.

The *labia minora* may likewise be absent on one or both sides.

There may be found four, or even six, due to a folding of the edges of the genital furrow. Sometimes the labia minora are much longer than usual, which peculiarity is found constantly in Hottentot women and has been called the *Hottentot apron*. These flaps are said to obtain a length of eight or twelve inches. In some tribes they are regularly cut away by a kind of circumcision.

The *labia majora* are more rarely the seat of a similar congenital hypertrophy.

Atresia vulvæ superficialis.—The labia majora as well as the labia minora may in the second half of fetal life become agglutinated, and coalesce more or less extensively from behind forward, so as to give the appearance of an uncommonly long perineum. It is rare that the nymphæ are grown together to such an extent as to prevent urination in the newborn child. Menstruation is unimpeded, but the dimensions of the entrance may be so small as to oppose a serious obstacle to sexual connection unless it be removed early in life.

Vulva infantilis.—By an arrest of development after the birth of the child the vulva may retain in the adult the small dimensions of childhood. If, nevertheless, impregnation takes place, the condition may give rise to difficulties in childbirth.

Hermaphrodism.[1]

Considerable practical no less than scientific interest attaches to that group of malformations which are designated by the term "hermaphrodism" or "hermaphroditism;" that is, the condition in which the characteristics of the two sexes become more or less blended in one individual.

The physician may have to decide at the birth of a child to what sex it belongs—a decision which, if hastily made, may lead to the gravest consequences and cause much unnecessary suffering, and which often cannot be made at all without an examination of the inner parts, as in Sippel and Chalmers's cases, where the child to all appearances was simply a male hypospadiæus, while the autopsy revealed a perfect uterus, ovaries, tubes, broad and round ligaments. If there is any doubt about the sex of a child, I think Lawson Tait's advice is a good one—to bring the child up as a male. When it grows up it will find out that it is not formed like other boys, and when grown to manhood, if unfit to perform the functions of the male, it will abstain from marriage. Girls are often in an astounding degree ignorant of everything

[1] Hermaphroditus, a son of Hermes (or Mercury) and Aphrodite (or Venus), according to Grecian mythology, became the object of the amorous desires of the nymph Salmacis, who induced the gods to make them one body, retaining the characteristics of both sexes.

belonging to sexual relations. An hermaphrodite brought up as a girl may, therefore, marry without having any idea of being unfit for sexual connection, or the male instincts may awake, and the male hermaphrodite, being brought up among girls, and placed in positions where the instincts can be satisfied, much mischief may be done, as in the case of Madelaine Mugnoz, the nun of Ubeda, who suffered death for rape. It is so much wiser to follow this advice as the possibility of erring by so doing is much smaller, male hermaphrodites being much more common than female.

Important medico-legal questions attach to the question of hermaphrodism. Often males only inherit certain estates, and it may become necessary to decide if the heir-apparent fulfils the necessary requirement as to sex. In the United States the right of voting as a citizen and of filling certain offices is restricted to the male sex, and consequently a man's right to do so may be challenged on account of doubtful sex. Hermaphrodism may be claimed as entitling to divorce, or the question may come up whether a child can be the offspring of an hermaphrodite or not.

Klebs's division of the different kinds of hermaphrodism recommends itself by its clearness, completeness, and practical value, and is therefore a valuable guide which we will follow.[1] This author disguishes first *true* from *spurious* hermaphrodism. As true hermaphrodism only such cases are recognized in which a testicle and an ovary are found in the same individual. Under the term spurious hermaphrodism he unites all those cases in which the genital glands belong to one sex and the external organs and internal ducts approach more or less the type of the other sex.

From the history of development we know that the genitals are composed of three different parts: first, the sexual glands; second, the two sets of ducts (the Wolffian ducts, which are transformed to the tail of the epididymis and the vas deferens; and the Müllerian ducts, which form the Fallopian tubes, the uterus, and the vagina); and third, the external genitals. These three portions having each its own independent foundation, we can understand how one of them may become developed according to a different type from the others.

True Hermaphrodism, or Androgynia (*Hermaphrodismus verus*).—This group comprises only the cases in which a testicle and an ovary are found in the same individual. This condition is normal

[1] The commonly-followed system distinguishes between *spurious* and *true* hermaphrodism. In the first class are only placed slight cases, such as hypospadias, enlarged clitoris, atresia of the vulva, etc., which we exclude all together. The second comprises three groups: 1, *Lateral hermaphrodism*, where there is a testicle on one side, an ovary on the other; 2, *vertical or double hermaphrodism*, where on the same side are found male and female organs; 3, *transverse hermaphrodism*, where the internal organs are male, the external female.

in many lower animals, and is occasionally found in the highest. Its existence in man is yet denied by many, and most of the older cases are not reliable. Only those can count in which a microscopical examination yields a positive result. It has been claimed that both testicles and both ovaries have been found in one individual (*true bilateral hermaphrodism*); and I think Heppner's case is one in point. In the body of a child that died at the age of two months he found (*a*) an organ which with the same right can be called a hypospadic penis and a hypertrophied clitoris; (*b*) a cleft scrotum; (*c*) a sinus urogenitalis and Rosenmüller's organ representing parovarium and epididymis; furthermore, a prostate and both testicles; and, finally, a vagina, uterus, tubes, both ovaries, round and broad ligaments. The microscopical examination showed the ovary to be full of Graafian follicles, some of which contained an ovum, while the testicle was composed of seminal canals. It seems that this most important case has been overlooked by Klebs, since he does not even allude to it.

It has likewise been asserted that on one side there may be one sexual gland, either a testicle or an ovary, and on the other both a testicle and an ovary (*true unilateral hermaphrodism*); but no authentic case is known of this kind. Klebs thinks that perhaps Bannon's case belongs to this group, but it appears from his abstract that he has not seen the original, since he is entirely misinformed in regard to many important points. The individual died at the age of twenty-six years, and was supposed to be a man. The external genitals were of an undecided character. There was a hymen, a vagina, and a uterus, from the left upper angle of which started a Fallopian tube, but it went between the uterus and rectum over to the right side to a body which is called an ovary. On the same side was found a testicle with epididymis, from which a long tube, which Bannon takes to be a vas deferens, went to the right upper angle of the uterus and communicated with its cavity. I therefore take it rather to be an elongated Fallopian tube. Behind and partly in the internal inguinal ring was found "a glandular organ." No description is given of the latter, nor does it seem to have been examined microscopically. The supposed ovary was submitted to such an examination, and a drawing is given of its appearance; but no description except the words "the granules visible are not Graafian follicles, but appeared to be fat-globules;" and the drawing has not the slightest resemblance to the structure of an ovary. The testicle had an albuginea and the tubular arrangement proper to that organ. The fluid contained in the commencement of the vas deferens and epididymis had the peculiar odor and consistence of the human semen. Under the microscope it showed numerous cells containing granules, but no trace of spermatozoids. It is clear that it was only, so to say, accidental that the left genital gland

was found on the right side, and no genital character is claimed for the "glandular organ" at the entrance of the inguinal canal; and while it must be admitted that the individual had a testis, it is not proved, and not even made likely, that he had an ovary. But if Heppner's case is admitted as one of true bilateral hermaphrodism, we may of course as well expect once to find a similar case with a double sexual gland on one side and a single on the other.

It is difficult yet not impossible to understand how the same individual can have more than one set of reproductive glands, for we have seen (p. 76) that it is one and the same body, which, identical in the beginning, later turns out to be either a testicle or an ovary. The connective tissue that goes to form the ovary or the testicle is indeed identically the same substance; but perhaps the epithelial part of the two glands has a different origin. Waldeyer thinks, namely, that the seminal canals are formed as invaginations from the Wolffian duct, while the follicles in the ovaries are derived from the germ-epithelium.

We have furthermore seen (p. 92) that supernumerary ovaries may be found, and that not only by a division of one larger body, but as a separate body of the size of a normal testicle. As to testicles, there is only one case on record of three testicles being found in the same individual at an autopsy, and even this case is not beyond dispute. The other cases regard living men, and are consequently still less convincing (Foerster). If thus we can have more than two glands of the same sex, the possibility of one or more of them having the type characteristic of the other sex is given.

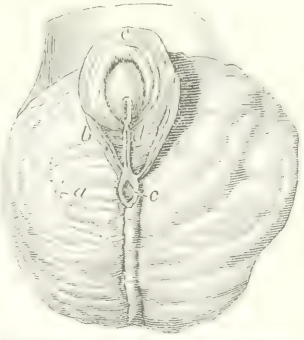
It must be admitted that at the very earliest point of development every human individual is, in a certain sense, hermaphroditic, inasmuch as there is a common foundation for the urogenital system, which very soon separates into two parts, the germ-epithelium and the epithelium of the Wolffian duct, the first of which is developed to the female sexual glands and ducts, while the second forms the male ducts, the uropoëtic system, and probably the male glands. Even in female individuals the beginning of seminal canals are found in the parovarium, and, on the other hand, sometimes some large cells are found in the surface epithelium of the testicle which are supposed to be primordial ova.

The third possibility of true hermaphrodism is the presence of a testicle on one side and an ovary on the other (*true lateral hermaphrodism*). From what we have just said about the identity of the two glands, it is not unlikely that one might be developed according to the male and the other to the female type.

The most important case of supposed true lateral hermaphrodism is a specimen found in the pathological museum at Zürich. It comes

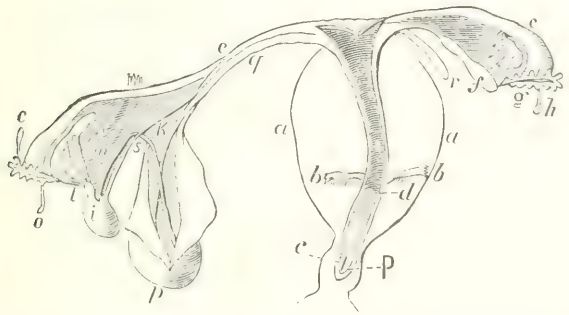
from a newborn child, and was first described by H. Meyer, and later examined microscopically and described by Klebs. (For details we must refer the reader to the work of the latter, *loc. cit.*, p. 728; here we must limit ourselves to the most important features of the case.) The child had a short penis with a large glans and a bulky prepuce (Fig. 102). On the end of the glans is a blind urethra. Below, the prepuce is continued in a fissure, the posterior part of which leads into the sinus urogenitalis. Behind this opening is a raphé uniting the two halves of a well-developed scrotum, in the left half of which is found a testicle. From the sides of the genital fissure, near the entrance to the sinus urogenitalis, start two low ridges of skin which run backward and outward to the root of the penis. On the posterior wall of the sinus urogenitalis is found a colliculus seminalis with several fine apertures, none of which lead to a vas deferens, but one, on the left side, leads into a vagina and uterus arcuatus (Fig. 103). A slight swelling round the genital canal at the seat of the colliculus seminalis shows the microscopical structure of the prostate. From the right horn of the

FIG. 102.



External Genitals in a case of hermaphrodismus lateralis: *a*, scrotum; *b*, labia majora; *c*, prepuce; *d*, labia minora; *e*, entrance to sinus urogenitalis. (From Klebs.)

FIG. 103.



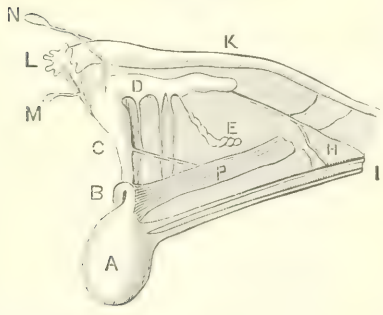
Internal Genitals of the same case of lateral hermaphrodism, seen from behind: *a*, bladder; *b*, *b*, ureters; *c*, vaginal entrance; *c*, *d*, vagina; *d*, external os; *e*, *e*, Fallopian tubes; *f*, ovary; *g*, parovarium; *h*, right Morgagni's hydatid; *i*, testicle; *k*, ovarian (or testicular) ligament; *l*, epididymis; *m*, bundle of vessels and nerves of the cord; *n*, vasa deferentia; *o*, *o*, hydatids of left tube; *p*, peritoneal pouch in left half of scrotum, containing *q*, left round ligament, and *s*, gubernaculum Hunteri; *r*, right round ligament; *P*, prostate. (From Klebs.)

uterus start the round ligament, the ovarian ligament leading to a club-shaped body supposed to be an ovary, and finally the Fallopian tube. Between the ovary and the tube is found a parovarium. The microscopical examination of the supposed ovary shows total *absence of fol-*

licles, with which the normal ovaries of newborn children are crowded. The stroma is composed of a dense fibrous tissue with many nuclei, as in the rete vasculosum testis, and tunnelled by numerous branching and anastomosing canals from 8 to 20 micromillimeters[1] in width. They have no proper wall, but the surrounding tissue forms a fine double contour. Their interior is filled with small polygonal cells measuring from 3 to 5 micromillimeters in diameter, and showing a nucleus and a granular protoplasm. Besides these small cells are in the larger canals found straggling larger cells measuring 11.4 by 7 micromillimeters, and distinguished from the others by their brightness. Klebs takes them to be primordial ova. Furthermore, he found in the few sections he made from the rare specimen a large round cavity measuring 80 by 64 micromillimeters, and surrounded by concentric fibres of connective tissue. It contained a fine granular mass and several nuclei measuring 5 by 7 micromillimeters. Although no ovum was found in this cavity, Klebs looks upon it as a follicle.

On the left side (Fig. 104 will give a clearer idea of the organs on this side) the round ligament descends into the open peritoneal pouch containing the testicle, and spreads out on the walls of the sac. At the end of the ovarian ligament (*I*), which here must be called a testicular ligament, is found an oval body which both macroscopically and microscopically answers to a testis. At the upper end of the testis (*A*) is found a coniform protuberans (*B*), which microscopically shows the texture of the rete testis. Inside of this body is found a bundle of blood-vessels and nerves (*P*) corresponding to the spermatic cord, but without any vas deferens. Between this bundle and the above-mentioned ligament is seen another ligament going from the testicle to the bottom of the pouch in which the testicle is enclosed. This ligament represents the gubernaculum testis (*H*). Above the rete testis is found the epididymis, the head (*C*) forming a right angle with the tail (*D*). From the tail start the vas aberrans Halleri (*E*) and some blood-vessels going to the above-mentioned bundle representing the spermatic cord. Finally, above the epididymis is seen the tube (*K*) with fimbriæ (*L*) and two small pedunculated cysts, the one (*M*) starting from the fimbria ovarica, and the other (*N*) connected by means of a peritoneal fold with the head of the epididymis, the hydatid of which it probably is.

Fig. 104.



I have given all these details because this is the best examined of all

[1] A micromillimeter, the sign for which is μ, is one-thousandth of a millimeter.

cases, but I do not agree with Klebs in his conclusion that the sexual gland on the right side is an ovary—a conclusion which is warranted neither by the external appearance nor by the structure of the body. On the contrary, it seems to me that the description of the histological composition reminds much more of a testicle than of an ovary.

There is another case of great interest which perhaps is one of true lateral hermaphrodism. It has the advantage over the former of being that of an adult, but the disadvantage that the person in question is still living, and that consequently the nature of the internal parts is subjected to doubt. We refer to the famous Catharine or Carl Hohmann.[1] This individual has been most carefully examined by such competent observers as O. von Franqué, Rokitansky, N. Friedreich, S. B. Schultze, and P. F. Mundé. We will use the masculine pronoun in speaking of this person, since his male nature is proved beyond a doubt, while the female is still *sub judice*. He was born in Bavaria in 1824, and spent the first forty-six years of his existence as a female. In his twelfth year the genitals and breasts increased in size, and soon afterward he began to feel sexual propensities, which at that time were entirely directed toward the male sex. At the age of seventeen he took unto himself a male lover, with whom he cohabited for twenty years. The attempts at coition were accompanied by the discharge of a thin viscid fluid from the urethra, the emission of which coincided with the orgasm and was not attended by any erection of the clitoris. Lascivious thoughts would be followed by this same emission, and sexual excitement always brought on a peculiar thrill or glow on the left side of the pelvis. In his nineteenth year a discharge of blood took place from the urethra, which for some time returned at irregular intervals and finally reappeared every three or four weeks, lasting from three to six days. This regular bloody discharge was preceded by tumefaction of the breasts, easy erectibility of the nipples, and the secretion of a colostrum-like fluid, which could be pressed out from the latter. This secretion disappeared again when he was about forty years old, and in his forty-third year the bloody discharge stopped. This periodical bloody discharge has been repeatedly watched and the fluid examined microscopically, so as to exclude every fraud. It was composed of mucus with fresh human blood-corpuscles exactly like menstrual blood. In his twenty-fifth or twenty-sixth year beard-hairs appeared, which he tore out.

In 1870 he made his first attempt at sexual intercourse as a man, and from that time he had nocturnal emissions of a fluid, the seminal nature of which has been proved with absolute certainty. It looked and smelt like semen, and on microscopical examination it was found to abound in well-shaped spermatozoids in lively movement.

[1] The name is sometimes spelt Homann (Rokitansky) or Humann (Von Franqué).

FIG. 105.

FIG. 105.—Penis and scrotum, side view.

FIG. 106.

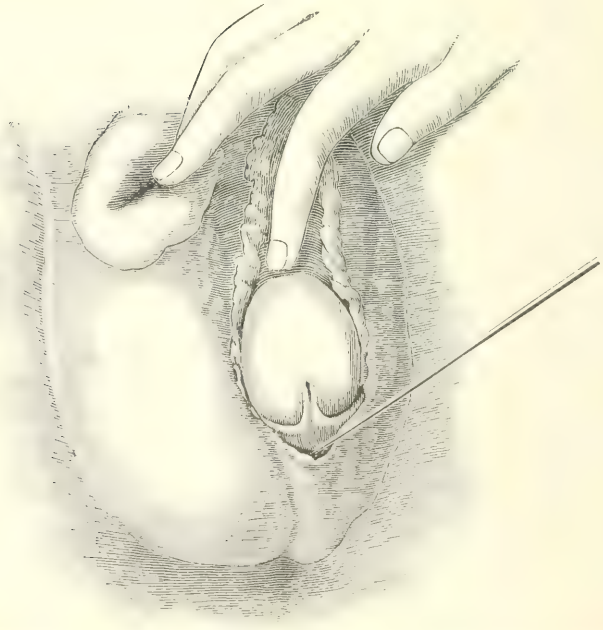


FIG. 106.—Same, more from the front, a stylet introduced into the opening of the urethra.

FIG. 107.

FIG. 107.—Upper Half of Anterior Surface, showing the breasts.

FIG. 108.

FIG. 108.—Posterior Surface, showing the long hair, the slender back, the broad hips, and the finer build of the left side.

FIG. 110.

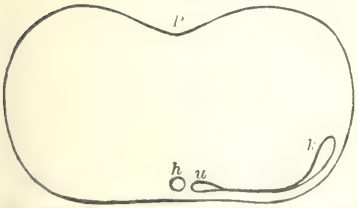


FIG. 110.—A supposed transverse section through the pelvis: *P*, promontory; *h*, urethra; *u*, uterus; *k*, sexual gland. Between *u* and *k* is seen the Fallopian tube.

FIG. 109.

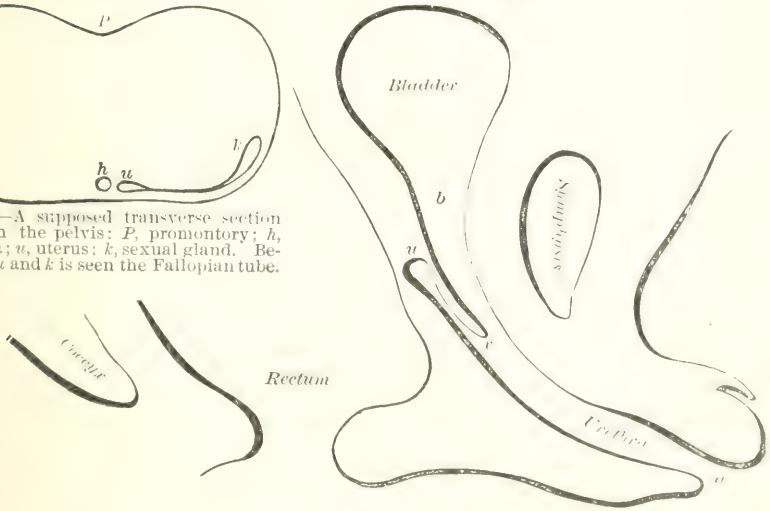


FIG. 109.—A supposed sagittal section: *a*, meatus; *v*, entrance to vagina; *u*, uterus.

Here, then, we have a human being uniting the production of semen with a periodical discharge of blood mixed with mucus from the genitals. Still, it would be risky to conclude from these premises that the individual has double sex in the strict sense of the word. While the presence of a testicle is proved, that of an ovary is yet doubtful. The presence of a periodical bloody discharge from the genitals is not conclusive, since a similar condition has been found combined with normal male genitals (Rayer), and especially in males suffering from hypospadias (Th. Allen, Morand).

Carl Hohmann has later donned manly attire, has had his hair cut short, and is married to a woman. Formerly he used to have wavy, black hair, descending to the waist, as seen in Fig. 108. The left side of the face has a feminine type, and the whole left side of the body is less strongly developed than the right. The beard is slight, but distinct. He has large, well-formed breasts, with large areolæ and large, prominent nipples. The larynx is large, with prominent pomum Adami, and the voice is deep and full, but Hohmann says he sings soprano. The back has a female curve. The pelvis approaches the male type, but seems to be more capacious than in the normal male. The hips are broad and the knees converge as in a woman.

The external genitals present a masculine appearance. He has a penis, bound as far as the glans to the subjacent integument. It is two and a half inches long,[1] but during turgescence it measures five and a half inches. At the end is a blind longitudinal furrow. The urethra opens on the posterior aspect of the glans near the corona, and admits easily a sound measuring twenty-four millimeters in circumference, which passes without resistance into the bladder. Below the urethral aperture is a shallow recess covered with integument, but no trace of a vagina. On the right side there is a well-developed scrotum and testicle, with epididymis and vas deferens. The left half of the scrotum is shorter, thinner, and more like a labium majus. At the bottom was formerly found a hard mass without distinct limits, which even then was looked upon as connective and adipose tissue, and which now has disappeared. In the left groin is found a body of the size of a bean, the nature of which cannot be ascertained, but which some observers take to be an atrophic testicle, while others think it is the empty sac of a crural hernia.

From the apex of the penis two tortuous folds of skin run upward to the mons Veneris. It has been surmised that they might represent labia minora. In the preceding case somewhat similar folds were found, but there they started from a lower point—namely, from the posterior end of the long cleft fræmulum, from which point they ran over the

[1] This is taken from Von Franqué's drawing. Friedreich says three inches, and Mundé one and a half.

scrotum to the root of the penis (Fig. 102). Klebs states (*loc. cit.*, p. 733) that Breisky has found similar folds in otherwise entirely normal women running from the posterior commissure to the inner surface of the labia majora.

As to the condition of the internal genitals, a medium-sized male catheter can be introduced through the urethra into a female genital canal, which deviates somewhat to the left and terminates in a button-shaped expansion (Fig. 109, *a*), the fundus uteri, from which a cord, taken to be a Fallopian tube, goes off to the left side of the pelvis, where it terminates in a somewhat movable cylindrical body several cubic centimeters large, which is sensitive to the touch, and probably is the left sexual gland; but whether it is a testicle or an ovary can only be settled by a future post-mortem examination. Thus this case as little as any other can be said to be positively proved to be one of true hermaphrodism. (Figs. 106–110, illustrating the description, are taken from the *American Journal of Obstetrics*, 1875, vol. viii. p. 615.)

Spurious Hermaphrodism (*Hermaphrodismus spurius*, s. *Pseudo-hermaphrodismus*).—By spurious hermaphrodism is meant the condition in which the sexual glands belong to one sex, either masculine or feminine, and the passages leading from them, as well as the external parts, more or less approach those of the other. Spurious hermaphrodism is subdivided according to the nature of the sexual glands into *male pseudo-hermaphrodism* and *female pseudo-hermaphrodism*, each of which comprises three groups, the first being formed by those cases in which the ducts alone belong to the opposite sex (*internal male or female pseudo-hermaphrodism*); the second, by those in which the external parts alone represent the opposite sex (*external male or female pseudo-hermaphrodism*); the third, those in which both the ducts and the external parts approach those normally found in the other sex (*internal and external complete male or female pseudo-hermaphrodism*).

Slight aberrations, such as atresia of the vulva in the female or hypospadias and slight enlargement of the prostatic vesicle in the male, due to local disturbances during fœtal development, are not counted as constituting hermaphrodism, but it may of course become difficult to draw the line.

Pseudo-hermaphrodism, as well as true hermaphrodism, dates from the earliest periods of fœtal development. It is much more common in the male than in the female sex, and it reaches likewise its greatest development in the former sex; so that the vagina, uterus, and tubes may be found more or less completely developed in an individual with testicles, vasa deferentia, seminal vesicles, and male external genitals.

The external genitals being formed of the same substance in the two sexes, it is not possible to have a double set of them, one male, the other

female; but some parts assume more of the one type, and others more of the other.

The general appearance of the body, especially in regard to the growth of hair, the development of the breasts, the prominence of the pomum Adami, the breadth of the hips, and the angularity or roundness of the contour of the body, presents commonly a mixture of both sexes, the preponderance being in conformity not with the real sex as determined by the sexual glands, but with the external genitals. Thus, a female with ovaries and male external genitals will, as a rule, be more like a man as to build, and a male with testicles and female external genitals commonly looks more like a female.

Literature Referred to.[1]

Ahlfeld, F.: *Die Missbildungen des Menschen*, Leipzig, 1880.

———: "Ueber einen Monopus mit vollständigem Mangel der aeusseren Genitalien und des Afters" (*Arch. f. Gynäk.*, 1879, vol. xiv. p. 276).

Aikman, John: "Case of Double Uterus and Vagina" (*Am. Journ. Obst.*, 1872, vol. v. p. 380, from *Glasgow Med. Journ.*, May, 1872).

Baer, B. F.: "A Case of Uterus Subseptus complicating the Third Stage of Labor" (*Am. Journ. Obst.*, 1883, vol. xvi. p. 180).

Bainbridge, J. N. and W.: "Case of Enlarged Clitoris" (*Med. Times and Gaz.*, Jan. 14, 1860, vol. i. p. 45).

Baker, W. H.: "Malpositions of the Uterus" (*New York Medical Journal*, Dec. 1878).

Bannon, A. P.: "On Hermaphrodism" (*Dublin Quarterly Journal*, August, 1852, No. xxvii. p. 66).

Barnes, F.: "A Case of Labor with Atresia Vaginæ" (*London Obst. Trans.*, 1883, vol. xxv. p. 99).

———: "Spurious Hermaphroditism" (*Lond. Obst. Trans.*, 1882, vol. xxiv. p. 188).

Barnes, R.: "On Hernia of the Ovary" (*Am. Journ. Obst.*, 1883, vol. xvi. p. 1).

Bastelberger: "Cyste im Hymen" (*Arch. f. Gynäk.*, 1884, vol. xxiii. p. 427).

Beigel, H.: *Pathol. Anat. der Weiblichen Unfruchtbarkeit*, Braunschweig, 1878, pp. 42, 43.

———: "Uterus unicornis dexter mit eigenthümlichen Verlauf der Tuba und des Ovariums links" (*Arch. f. Gynäk.*, 1877, vol. xi. p. 380).

Borinsky, S.: "Daseine Horn eines Uterus duplex als irreponibles Hinderniss für die Extraction bei der Entbindung des andern Hornes" (*Arch. für Gynäk.*, 1877, vol. x. p. 145).

Breisky, A.: "Hydrometra lateralis" (*Arch. für Gynäk.*, 1874, vol. vi. p. 89).

———: "Pyometra und Pyocolpos lateralis" (*Arch. für. Gynäk.*, 1871, vol. ii. p. 84).

———: "Ein neuer Fall von Pyometra und Pyokolpos lateralis" (*Arch. für Gynäk.*, 1871, vol. ii. p. 451).

Brown, W. S.: "Atresia Vaginæ" (*Am. Journ. Obst.*, 1880, vol. xiii. p. 192).

Carter, C. H.: "Absence of the Vagina" (*Lond. Obst. Trans.*, 1880, vol. xxii. p. 251).

Chalmers: "Hermaphrodite" (*Lond. Obst. Trans.*, 1882, vol. xxiv. p. 239).

———: "Spurious Hermaphroditism" (*Lond. Obst. Trans.*, 1883, vol. xxv. pp. 129, 162).

Chambers, T.: "A Case of Congenital Inguino-ovarian Hernia" (*Lond. Obst. Trans.*, 1879, vol. xxi. p. 256).

[1] Works mentioned in the preceding article ("The Development of the Female Genitals") are not repeated.

CLEVELAND, W. F.: "Infant of Doubtful Sex" (*Lond. Obst. Trans.*, 1868, vol. ix. p. 29).

COEN: "A Case of Absence of Uterus and Vagina, and other Malformations" from *Annali Universali de Med.*, Jan., 1884, in *Centralbl. f. Gynäk.*, 1884, vol. viii. p. 744).

COPEMAN, E.: "On the Treatment of Imperforate Hymen" (*Lond. Obst. Trans.*, 1869, vol. x. p. 246).

CROSS, E.: "A Case of Occlusion of the Vagina complicated by Pregnancy" (*Am. Journ. Obst.*, 1883, vol. xvi. p. 809).

DAVIES, G.: "Abdominal Cyst in a Newly-born Child" (*Lond. Obst. Trans.*, 1877, vol. xix. p. 5).

DAVIS, E. H.: "Case of Atresia of the Vagina" (*Am. Journ. Obst.*, 1872, vol. v. p. 396).

DE FOREST, W.: "Case of Spurious Hermaphrodism" (*Am. Journ. Obst.*, 1876, vol. ix. p. 500).

DIRNER, G. A.: "Ein Fall von doppelter Gebärmutter mit doppelter Scheide (Uterus didelphys c. vagina duplice)" (*Arch. f. Gynäk.*, 1883, vol. xxii. p. 463).

DOHRN, R.: "Die Bildungsfehler des Hymens" *Zeitschr. f. Geburtshülfe u. Gynäkologie*, 1884, vol. xi. p. 1).

———: "Ein Fall von Atresia vaginalis" (*Arch. für Gynäk.*, 1877, vol. x. p. 544).

———: "Ein verheiratheter Zwitter" (*Arch. für Gynäk.*, 1877, vol. xi. p. 208).

———: "Ein verheiratheter Zwitter" (*Archiv für Gynäk.*, 1884, vol. xxii. p. 225).

DORAN, A.: "Deficient Development of the Uterus (*Uterus fœtalis*), Atresia of the Os Externum, Atrophy of the Ovaries, Insanity" (*Lond. Obst. Trans.*, 1879, vol. xxi. p. 253).

———: "Dissection of the Genito-urinary Organs in a Case of Fissure of the Abdominal Walls" (*Journ. Anat. and Physiol.*, 1881, vol. xv. p. 226).

———: "Congenital Communication between the Rectum and the Genito-urinary Tract" (*Lond. Obst. Trans.*, 1880, vol. xxii. p. 79).

DUNCAN, M.: "Case of So-called Imperforate Hymen" (*Lond. Obst. Trans.*, 1882, vol. xxiv. p. 212).

———: "Delivery in a Case of Double Uterus" (*Lond. Obst. Trans.*, 1881, vol. xxiii. p. 21).

———: "Pyometra" (*Lond. Obst. Trans.*, 1879, vol. xxi. p. 54).

EMMET, T. A.: "A Case of Hermaphrodism" (*Am. Journ. Obst.*, 1881, vol. xiv. p. 882).

———: "Congenital Absence and Accidental Atresia of the Vagina" (*Am. Gyn. Trans.*, 1877, vol. ii. p. 437).

FOERSTER, A.: *Handbuch der Pathologischen Anatomie*, 2te Aufl., Leipzig, 1863.

FORT, C. H.: "Some Corroborative Facts in Regard to the Anatomical Difference between the Negro and White Races" (*Am. Journ. Obst.*, 1877, vol. x. p. 258).

FRANQUÉ, O. VON: "Beitrag zur Lehre über den Hermaphroditismus lateralis" (*Scanzoni's Beiträge zur Geburtshülfe und Gynäkologie*, vol. v. p. 57, Würzburg, 1869).

FREUND, WM. A.: "Horseshoe Kidney, with Absence of Internal Organs of Generation" (*Am. Journ. Obst.*, 1876, vol. ix. p. 349, from *Berl. Beitr. z. Geb. u. Gyn.*, iv. i.).

FRIEDREICH, N.: "Der Hermaphrodit Catharina Homann" (*Virchow's Archiv*, vol. xlv. pp. 1–8).

GALABIN, A. L.: "Retention of Menstrual Fluid in one half of a Double Uterus" (*Lond. Obst. Trans.*, 1882, vol. xxiv. p. 21).

GARRIGUES, H. J.: "The Obstetrical Treatment of the Perineum" (*Am. Journ. Obst.*, April, 1880, vol. xiii. p. 231).

GERVIS, H.: "Case of Transverse Septum in the Vagina" (*Lond. Obst. Trans.*, 1882, vol. xxiv. p. 210).

———: Case of Double Vagina and Uterus" (*Lond. Obst. Trans.*, 1877, vol. xix. p. 271).

GRACE, H.: "Case of Double Uterus, with Simultaneous Gestation" (*Lond. Obst. Trans.*, 1863, vol. iv. p. 138).

HEGAR, A.: *Die Castration der Frauen*, Leipzig, 1878.

HEPPNER, C. L.: "Ueber den wahren Hermaphroditismus beim Menschen" (*Reichert's Archiv*, 1870, p. 679).

HICKS, J. B.: "An Unilateral Uterus and Kidney, with Two Ureters" (*Lond. Obst. Trans.*, 1879, vol. xxi. p. 57).

———: "Case of Congenital Abnormality of the Uterus simulating Retention of Menses" (*Lond. Obst. Trans.*, 1880, vol. xxii. p. 260).

———: "Five Cases of Vaginal Closure" (*Lond. Obst. Trans.*, 1863, vol. iv. p. 228).

———: "Case of Pregnancy with Double Uterus and Vagina" (*Lond. Obst. Trans.*, 1881, vol. xxiii. p. 23).

———: "Vertical Septum in Lower Part of Vagina, impeding Labor" (*Lond. Obst. Trans.*, 1881, vol. xxiii. p. 24).

———: "Absence of Uterus and Ovaries: on the top of the vagina a large cyst half filled with a cheesy white matter, and the rest with dark grumous material like old clots" (*Lond. Obst. Trans.*, 1880, vol. xxii. p. 262).

HILDEBRANDT, H.: "Die Krankheiten der Aeusseren Weiblichen Genitalien" (*Billroth's Frauenkrankheiten*, vol. iii., part vii., Stuttgart, 1877).

HOWITZ, F.: "Laparotomi for Pyometra i höjre Uterushorn" (*Howitz's Gynæk. og Obst. Meddelelser*, 1881, vol. iii. p. 70).

HYATT, H. O.: "Note on the Normal Anatomy of the Vulvo-vaginal Orifice" (*Amer. Journ. Obstet.*, 1877, vol. x. p. 253).

JACKSON, A. R.: "A Contribution to the Relations of Ovulation and Menstruation" (*Journ. Am. Med. Assoc.*, Chicago, 1884).

JOHANNOVSKY, V.: "Einige Bildungsfehler der Weiblichen Genitalien aus der Gynäkologischen Klinik des Prof. Breisky in Prag" (*Arch. f. Gynäk.*, 1877, vol. xi. p. 371).

KALTENBACH: "Demonstration eines Uterus unicornis mit geplatztem gravidem Nebenhorn" (*Arch. f. Gynäk.*, 1883, vol. xxii. p. 172).

KLEBS, E.: *Handbuch der Pathologischen Anatomie*, Berlin, 1876.

KLOB, J. M.: *Pathologische Anatomie der Weiblichen Sexualorgane*, Wien, 1864.

KUSSMAUL, A.: *Von dem Mangel, der Verkümmerung und Verdopplung der Gebärmutter*, Würzburg, 1859.

LEBEDEFF, A.: "Ueber Hypospadie beim Weibe" (*Arch. f. Gynäk.*, 1880, vol. xvi. p. 290).

LE FORT, L.: *Des Vices de Conformation de l'Utérus et du Vagin, et des Moyens d'y remédier*, Paris, 1863.

LENTE, F. D.: "Operation for Atresia Vaginæ" (*Am. Journ. Obstet.*, 1877, vol. x. p. 85).

LEOPOLD, G.: "Ein männlicher Scheinzwitter. Pseudo-hermaphrodismus externus"[1] (*Arch. f. Gynäk.*, 1876, vol. viii. p. 487).

———: "Ueber eine vollständige männliche Zwitterbildung" (*Arch. f. Gynäk.*, 1877, vol. xi. p. 357).

MADGE, H. M.: "Four Cases of Congenital Imperforate Vagina, and one Case of Congenital Phymosis, occurring in the Same Family" (*Lond. Obst. Trans.*, 1870, vol. xi. p. 213).

MANN, M. D.: "A Specimen of an Infant Uterus Bicornis Duplex and Vagina Septa" (*Am. Journ. Obst.*, 1874, vol. vii. p. 274).

———: "Case of Uterus Bicornis, with a Partial Vaginal Septum" (*Am. Journ. Obst.*, 1877, vol. x. p. 666).

[1] Since there was a vagina eight centimeters long, I think this ought rather to be regarded as a case of pseudo-hermaphroditismus masculinus internus and externus; so much more so as the examination was made on a living person, and perhaps rudiments of the uterus and the tubes may have been present.

MAYERHOFER, C.: "Entwickelungsfehler der Gebärmutter" (*Billroth's Handbuch der Frauenkrankheiten*, vol. i. part 2).

MEADOWS: "A Case of Inguinal Hernia of the Right Ovary successfully Removed" (*Lond. Obst. Trans.*, 1862, vol. iii. p. 438).

MEYER, L.: *Uterinsygdommene som Sterilitetsaarsag*, Copenhagen, 1880.

———: *Det Normale Svangerskab, Fødsel og Barselseng*, Copenhagen, 1882.

MOLDENHAUER: "Ein besonderer Fall von Schwangerschaft in einer einhörnigen Gebärmutter" (*Arch. für Gynäk.*, 1875, vol. vii. p. 175).

MOSSMANN, B. E.: "A Case of Congenital Atresia of the Vagina" (*Am. Journ. Obst.*, 1881, vol. xiv. p. 564).

MOWAT, G.: "A Case of Apparent Absence of Uterus" (*Lond. Obst. Trans.*, 1878, vol. xx. p. 289).

MUNDÉ, P. F.: "A Case of Single Uterus with Double Cervix and Vagina" (*Am. Journ. Obst.*, 1878, vol. xi. p. 575).

———: "A Case of Presumptive True Lateral Hermaphrodism" (*Am. Journ. Obst.*, Feb., 1876, vol. viii. pp. 615–631).

NACKE: "Uterus bicornis septus, Vagina partim septa, Hæmatometra dextra, Hæmatosalpinx dextra, Hæmatocolpos, etc." (*Arch. für Gynäk.*, 1876, vol. ix. p. 471).

NEUGEBAUER, L.: "Einseitige Hämatometra bei zweitheiligem Uterovaginalkanale" (*Arch. für Gynäk.*, 1871, vol. ii. p. 247).

NIEBERDING: "Casuistischer Beitrag zu den Gynatresien" (*Arch. für Gynäk.*, 1882, vol. xx. p. 336).

NIELSEN, P.: "Om Atrofi af Uterus" (*Howitz's Gynækologische og Obstetricishe Meddelelser*, Copenhagen, 1884, vol. v. p. 74).

OLSHAUSEN, R.: "Die Krankheiten der Ovarien," Stuttgart, 1877 (*Billroth's Handbuch der Frauenkrankheiten*, vol. ii.).

OSTERLOH: "Atresia ani vaginalis" (*Arch. f. Gynäk.*, 1875, vol. vii. p. 565).

PALMER: "Two Hermaphrodite Sisters" (*Am. Journ. Obst.*, 1880, vol. xiii. p. 174).

PEASLEE, E. R.: "Case of Uterus Didelphys Septus et Vagina Septa" (*Am. Journ. Obst.*, 1876, vol. ix. p. 651).

———: "Solid Uterus Bipartitus" (*Am. Gyn. Trans.*, 1876, vol. i. p. 340).

POOLEY, J. H.: "On Imperforate Anus, the Rectum communicating with the Vagina" (*Am. Journ. Obst.*, Feb., 1872, vol. iv. p. 676).

———: "Case of Absence of the Uterus and Vagina" (*Am. Journ. Obst.*, May, 1871, vol. iv. p. 70).

PROCHOWNICK: "Fall von Menstruatio præcox mit Sectionsbericht" (*Arch. f. Gynäk.*, 1881, vol. vii. p. 330).

RHEINSTAEDTER: "Rudimentäre Entwickelung weiblicher Generationsorgane" (*Arch. f. Gynäk.*, 1879, vol. xiv. p. 497).

RICHMOND, J. M.: "A Successful Operation for Atresia Vaginæ" (*Am. Journ. Obst.*, 1884, vol. xvii. p. 600).

ROBERTS, D. L.: "Bicorned Uterus" (*Lond. Obst. Trans.*, 1872, vol. xiii. p. 312).

ROGERS, L.: "A Case of Male Hermaphrodism" (*Am. Journ. Obst.*, 1876, vol. ix. p. 171), from *Cincinnati Lancet and Observer*.

ROGERS, W. R.: "Case of Vagina and Uterus divided by a Septum" (*Lond. Obst. Trans.*, 1871, vol. xii. p. 29).

ROKITANSKY: "Verhandlungen der Wiener Gesellschaft der Aerzte" (*Wiener Medicinische Wochenschrift*, 1869, p. 724).

ROSE, COOPER: "Case of Extravasation of the Bladder, Absence of the Rectum, the Colon opening through the wall of the Ectopic Bladder, Absence of the Symphysis Pubis, and the Development of the Uterus in Two Lateral Portions" (*Lond. Obst. Trans.*, 1874, vol. xv. p. 128).

———: "Case of Extreme Hypospadias" (*Lond. Obst. Trans.*, 1877, vol. xix. p. 256).

ROUTH, C. H. F.: "Case of Absence of Vagina, with Retained Menses in Utero and Fallopian Tubes" (*Lond. Obst. Trans.*, 1871, vol. xii. p. 34).

ROUTH: "Case of Bilocular Uterus"[1] (*Lond. Obst. Trans.*, 1871, vol. xii. p. 295).

SAPPEY, P.: *Traité d'Anatomie descriptive*, Paris, 1857–64.

SCHATZ, F.: "Sieben Fälle von unvollkommener Vereinigung des weiblichen Genitalkanales bei Erwachsenen" (*Archiv für Gynäk.*, 1871, vol. ii. p. 289).

———: "Ein besonderer Fall von Misbildung des weiblichen Urogenitalsystems" (*Arch. für Gynäk.*, 1872, vol. iii. p. 304).

———: "Geburt eines Monstrums. Drei Fälle von einhörnigem Uterus" (*Arch. für Gynäk.*, 1870, vol. i. p. 153).

SCHOFIELD, R. H. A.: "The Delivery of a Monster" (*Lond. Obst. Trans.*, 1879, vol. xxi. p. 71).

SCHROEDER, C.: *Handbuch der Krankheiten der weiblichen Geschlechtsorgane*, Leipzig, 1874.

SIMPSON, J. Y.: "Hermaphroditism" (*Obstetric Works*, vol. ii. pp. 203–328, Philadelphia, 1856).

SIPPEL, A.: "Ein Fall von schwieriger Geschlechtsbestimmung" (*Arch. f. Gynäk.*, 1879, vol. xiv. p. 168).

SMITH, A. G.: "The Position of the Hymen in the Negro Race" (*Am. Journ. Obst.*, 1877, vol. x. p. 638).

SMITH, H.: "A Case of Delivery through an Imperforate Vagina" (*Lond. Obst. Trans.*, 1881, vol. xxiii. p. 117).

SQUAREY, C. E.: "Three Sisters in whom the Uterus and Ovaries were Absent" (*Lond. Obst. Trans.*, 1873, vol. xiv. p. 212), with other cases mentioned in the discussion.

STADFELDT, A.: "Nogle Tilfælde af Misdannelser i Genitalkanalen hos Kvinden" (*Howitz's Meddelelser*, vol. ii. p. 24, Copenhagen, 1879).

SWASEY, E.: "An Interesting Case of Malformation of the Female Sexual Organs" (*Am. Journ. Obst.*, 1881, vol. xiv. p. 94).

TAIT, L.: "Hermaphroditism" (*Am. Gyn. Trans.*, 1876, vol. i. 318).

TARDIEU, A.: *Étude Médico-légale sur les Attentats aux Mœurs*, Paris, 1878.

TAYLOR, I. E.: "Atresia of the Vagina, Congenital or Accidental, in the Pregnant or Non-Pregnant Female" (*Am. Gyn. Trans.*, 1879, vol. iv. p. 404).

TELLER, S.: "Repeated Pregnancy in a Uterus Bicornis" (*Am. Journ. Obst.*, 1884, vol. xvii. p. 142).

TURNIPSEED, E. B.: "Some Facts in Regard to the Anatomical Difference between the Negro and White Races" (*Am. Journ. Obst.*, 1877, vol. x. p. 32).

WALKER, H. F.: "A Case of Uterus Septus and Vagina Septa" (*Am. Journ. Obst.*, 1875, vol. viii. p. 515).

WATTS, R.: "Case of Double Vagina with Single Uterus" (*Am. Journ. Obst.*, 1877, vol. x. p. 279).

WERNER, M. B.: "Battey's Operation Performed in a Case of Malformation of the Generative Organs" (*Am. Journ. Obst.*, 1884, vol. xvii. p. 144.).

WERTH: "Rudimentäre Entwickelung der Müllerschen Gänge Doppelseitige Hernia ovarialis inguinalis" (*Arch. f. Gynäk.*, 1877, vol. xii. p. 132).

WHITTAKER, J. T.: "Agenesis Urethræ, etc." (*Am. Journ. Obst.*, 1870, vol. iii. p. 389).

WILSON, H. S.: "Notes on a Fœtus" (*Lond. Obst. Trans.*, 1879, vol. xxi. p. 58).

WINCKEL, F.: *Die Pathologie der Weiblichen Sexualorgane*, Leipzig, 1881.

WITTNER: "Einige Fälle von Misbildung des Uterus," Leipzig, 1869 (*Arch. für Gynäk.*, 1870, vol. i. p. 190).

[1] Seems to be a *uterus bicornis unioris*.

GYNECOLOGICAL DIAGNOSIS.

By EGBERT H. GRANDIN, A.B., M.D.,
New York.

The diagnosis of disease of the female generative organs is beset by peculiar difficulties to which no other branch of medicine can, in the same degree, lay claim. The organs of generation in the female are protected from scrutiny, at the outset, by that inherent modesty which causes woman to rebel against the mere thought of examination, and furthermore, these organs are so situated that it is largely by the sense of touch, direct or indirect, that deviation from the normal is to be detected. The intimate connection also which exists between the sexual and other systems of the human body can but increase the obstacles in the way of localization of disease, necessitating, therefore, the use of the judicial faculty in a peculiarly high degree. The gynecologist hence must possess, above all, tact, delicacy of touch, and that broadness of mind which will allow of his looking beyond the organs he habitually treats, in the recognition of the fact that symptoms pointing to the uterus do not necessarily mean disease of that organ, and, what is equally true, that serious uterine disease may be masked under symptoms directing attention to some other organ of the body. The broad truth must not be lost sight of that gynecology is but a part of a grand whole. Its basis is medicine, and it is irrational to enter on its practice without ever bearing in mind that it is but a link in a complex chain, which, lengthened in time, and still lengthening, necessarily requires subdivision that each link may be better forged, each part more fitly adapted to the whole. Therefore the natural origin and the need of the "specialties," and therefore the too-little recognized truth that he will make the most successful gynecologist who has first been a general practitioner, and also that the latter cannot hope to vie with the former without thorough and systematic training in the special manipulation which belongs properly to modern gynecology.

Toward the diagnosis of disease of the female generative organs we are assisted, even as in other branches of medicine, by the history of the patient, whereby we obtain the rational signs, and by the local examination, whereby we negative or confirm the diagnosis suggested

by these rational signs. These two divisions I shall consider separately, first premising, in a general way, that the symptomatology should never carry too much weight, for woman, especially when the victim of fancied disease, will deceive not only herself, but also her physician if perchance his credulity be stronger than his judgment.

Rational History.

In obtaining the rational signs it is of great advantage to proceed systematically, and to follow the same routine method of questioning in each case. For this purpose it is well to have a record-book, wherein, under appropriate headings, the obtained answers—as well as, later on, the results of the physical examination—may be recorded. Each one may construct such a scheme for himself in accordance with the manner which experience teaches him is the most appropriate for conducting his examination. I therefore do not deem it necessary to introduce one here. Sufficient the statement that, in general, our questions should, at the outset, aim at obtaining from our patient information in regard to what may be termed the etiological factors on which may possibly depend the symptoms, which, later on, she herself is to be allowed to give. Our verbal examination, hence, is first direct, and then indirect.

By direct questioning we obtain answers to the following: 1, the social position and occupation of the patient; 2, the age and state (whether married or single); 3, the number of children and miscarriages; 4, the health of parents and previous personal health; 5, the performance of the menstrual function; 6, the date of appearance of symptoms.

The answers given to these questions obviously have an important bearing on the further history of the case, and will govern us, in a measure, in our decision as to the necessity of a local examination. With the maiden, for instance, we may usually at once eliminate diseases the followers of childbearing and of impure or inordinate coitus, and direct our questions toward ascertaining the state of the general health and the performance of the menstrual function. Knowledge of the social position and occupation of our patient is of value, since, obviously, that which is laborious or of a confined nature is apt to impress alterations on the system either general or local, and since, too, habits of indolence or of luxury carry ills in their train, largely, in these days, owing to the pernicious method of dress which is in vogue. The age of our patient is particularly of value, as allowing the exclusion of those new growths the tendency toward which increases with age, as also as indicating to us, in certain cases, the prognosis as regards, it may be, sterility, it may be the disappearance of some symptom the

relief from which may only be looked for at the menopause. The state and the age together are to be taken into consideration in our decision as to the necessity of a local examination; and I would say here that in the unmarried it is exceptional that an examination is requisite until general constitutional measures have been tried without avail. Of course I exclude from this dictum emergencies, such as sudden hemorrhage or symptoms pointing so clearly to the sexual organs that our past experience teaches us it is but folly to temporize.

With the married, on the other hand, whilst we must guard ourselves against the assumption that there necessarily exists disease of the generative organs, our line of questioning must be widely different. The fulfilment of the purposes for which marriage was instituted too frequently entails functional or organic derangement, and, as it is our business to use every proper means for the detection of abnormalities, we need not be too chary in our speech—indeed, must sometimes, to fulfil our whole duty, even ask questions which touch upon the most delicate possible ground. Such are—the frequency of intercourse, the sensations evoked, the completeness or incompleteness of the act, the retention or non-retention of the semen: these are questions the answers to which will frequently give us a clue to the cause of menstrual derangement or the possible cause of sterility.

If the patient be married, information must next be sought in regard to the number of children or miscarriages she has had, of the interval which has elapsed since the last delivery, as to the duration of the several labors, instrumental interference, length of the puerperium, and incidents peculiar to it. We are thus often led to suspect that our local examination will reveal some injury to the genital tract, or pelvic exudation recent or chronic—a suspicion which obviously influences strongly in the decision as to the necessity of a local examination. It is important also to question our patient in regard to the function of lactation, on account of the very decided influence which its due and proper performance has on uterine involution. In case of one or more miscarriages, we must determine as accurately as possible the month at which they occurred, ascertain the probable cause and the manner of care the patient received, and, where habit is the probable factor, seek behind this convenient term for the real factor in order to scientifically bring to bear on its cure every possible means at our disposal, including, of course, examination and treatment of the husband in those cases, by no means infrequent, where he must bear the partial or entire onus of premature blighting of the ovum. In this connection, too, it should ever be borne in mind that the abuse—or, strictly, the use—of certain means for the prevention of conception at such times when offspring are not desired frequently acts like a double-edged sword, and through its injurious effects on the sexual organism prevents the bringing to term

of the ovum which has been fructified designedly. These means may, therefore, be indirectly responsible for miscarriage, so that the question is pertinent whether they are resorted to.

Inquiry in regard to the health of our patient's parents is too often neglected, and yet is of great importance. Whilst the influence of heredity has never as yet been distinctly formulated, there are sufficient data at our disposal to warrant the assertion that ancestral disease may so modify the nutrition and configuration of the offspring as to render it more accessible to disease, even if this be not directly implanted. The so-called scrofulous taint may unquestionably, in a latent form, be responsible for deviation from health in the genital system, even as it is in other departments of the body; and the like holds true of other constitutional diseases which we are prone to look upon as hereditary. I rank this question as an important one advisedly, because I know that through a proper appreciation of its import very frequently the prognosis and the treatment of apparent disease of the genital system will depend upon and lie through constitutional measures rather than local.

And this remark holds true as well of an associated question—the previous state of health of the patient herself. Much valuable information, and in an obscure case very necessary, may be gleaned from close questioning on this point. A sore throat and loss of hair following closely on marriage may, in the absence of certain positive signs, but taken in connection with slight negative, offer a probable explanation for frequent miscarriage. The parenchymatous degeneration of the muscles which accompanies high febrile states not improbably may modify the organs of generation sufficiently to prevent their normal function. These remarks are simply made to indicate the line of thought which answers to this question might suggest: to discuss the subject at length would lead me entirely too far.

We are next to obtain the menstrual history of our patient. In the young and unmarried it is usually derangement of the menstrual function which brings the patient to the gynecologist—it may be amenorrhœa, it may be irregularity in, or pain during, the performance of the function. These are the very cases in which there is difficulty, especially, in deciding as to the necessity of a local examination. I would again strongly deprecate recourse to a local examination in the unmarried before the special features of the case have been carefully sifted, and varied and prolonged attempts have been made by means of general constitutional measures to relieve what, in the young and growing maiden, is often due to method of life or to chlorosis. Nothing but very urgent symptoms should justify local examination of the young girl who has scarcely passed the pubescent period. In her, derangement of menstruation, such as skipping a period, dysmenorrhœa, con-

gestive signs due to scanty flow, are not necessarily pathological factors. It takes time for the menstrual habit to become regularly and normally acquired; and where an examination is needlessly resorted to an unlooked-for effect may be profound injury to the maiden's *morale*. There is, however, a group of symptoms which should ever speak in favor of a local examination, and this is constituted by the conjoined factors amenorrhœa, congestive signs, and molimina. The regular recurrence of these symptoms should suggest possible occlusion of the vagina with retention of menses—a condition calling for early resort to operative interference.

Our questions concerning menstruation should be in regard to the age at which the function was established, the regularity with which the flow recurs, the duration, amount, and character of the flow, the presence of pain before, during, or after the flow, and the date of the last menstruation. If amenorrhœa be complained of, we should always bear in mind the physiological cause, and suspect pregnancy until we have for ourselves disproved it. In exceptional cases, however, amenorrhœa will only apparently exist, for on close questioning the fact will be revealed that for a number of days each month there is an increased white discharge which the patient takes for an aggravation of her leucorrhœa, but which the physician, in case there be accompanying molimina, will recognize as the so-called white menses, and thereby essentially modify his prognosis. The presence of molimina also assists us in our diagnosis and prognosis of those cases of amenorrhœa where the local examination reveals an undeveloped state of the uterus or ovaries. The number of days during which the flow lasts, its amount (determined in our better classes by the average number of napkins worn), the presence of clot or of membrane in the flow,—are all questions bearing on our diagnosis and ultimate method of treatment. If menstrual pain be complained of, it is important to time its rhythm—that is to say, to determine whether the pain precedes, accompanies, or follows the flow—for thus we are in a position to decide whether the probable cause be uterine or ovarian. It is almost superfluous to state that it is always essential to know the date of the patient's last period, although undue weight is never to be given to her statement on this point should the local examination give us cause to think that the patient is either endeavoring to deceive us, or else that the discharge at the last stated period occurred notwithstanding the presence of an impregnated ovum within the uterus.

The last question, the length of time since the appearance of the symptoms, has in part an etiological bearing and in part a diagnostic. In the young unmarried female a common starting-point of symptoms is imprudence during menstruation. By imprudence I refer not alone to the neglect of avoidance of causes which result in checking this phys-

iological function, and yet such a disagreeable function in so far as it often interferes with the plans and wishes of, especially, our young maidens of higher social life: my meaning is still broader, including as it does the general neglect of proper rest, both mental and physical, at the time of the periods the most critical of all—the year or so following the establishment of puberty. Derangements of menstruation, chronic congestion and displacements of the pelvic organs, ovaralgia and ovaritis,—such, in their *ensemble*, are the pathological factors which may be traced to neglect of rational precautions during menstruation. In the married, symptoms very frequently may be traced to abuse of the sexual act. This is particularly noticeable in the newly-married, in whom symptoms will be found to depend on the constant state of congestion in which the pelvic organs are kept. Thus are explainable, often, menorrhagia dating from the time of marriage, ovaralgia, backache, dragging pains in the abdomen, vague hystero-neurotic symptoms. A further cause of symptoms in the married is the resort to means for the prevention of conception—in particular, I believe, vaginal injections taken immediately after the sexual act, and in such haste that the temperature of the water is not attended to, and in consequence the congestion naturally following the sexual act receives sudden and harmful check. Again, the measures resorted to by far too many married women to destroy the undesired fruit of the womb obviously can but react unfavorably on the pelvic organs. Abuse of function invariably leads to pathological alteration: in order to determine, therefore, the degree to which pathology has affected the sexual organism of our patients it is necessary to know not only the cause of symptoms, but, as far as possible, the length of time during which such cause has been at work. Thus it is that even through questioning which bears more particularly on etiology we are assisted toward correct diagnosis.

I have now sketched briefly the nature of what may be termed the preliminary questions, and I pass to the consideration of symptoms of which the patient complains or which are drawn out by the examiner. And here I would remark that there are but few symptoms which singly can properly be regarded as peculiar to disease of the female pelvic organs. It is only, usually, when taken in their *ensemble* that they justify the inference that there exists organic or functional derangement. And even as symptoms of themselves are so deceptive, so too should we carefully gauge our patient, lest she endeavor to deceive us for a purpose or is in reality deceiving herself. Desire for sympathy, the impulses of hysteria, the wish which is often the father to the thought,—are each incentives in the making of a plausible history, the worth of which it rests with the physician to decide. I do not mean that he is not to give credence to the symptoms unless he can find a cause; I would simply warn against allowing a skein of symp-

toms skilfully woven to lead the perception and judgment away from that which really exists. It is well too to allow the patient to tell her own story—a tedious method, certainly, but one through which we are more apt to reach the exact truth than if leading questions were put. Of course, after the patient has told us all she can or will, it rests with the examiner to fill in the gaps, and thereby possibly obtain information which has been concealed.

In general, the symptom which ordinarily drives the patient to consult the gynecologist is pain. This pain may be in various parts of the body, and it is its association with other symptoms emanating from, or so situated as to suggest their origination in, some portion of the genital system which attracts attention to the pelvic organs. Pain in the back, lumbar or sacral, is a symptom common to the majority of women, and evidently its cause may be entirely independent of the uterus or its adnexa. The lifting of heavy weights, occupations which require prolonged flexion of the trunk on the pelvis, the injudicious use of the sewing-machine,—these are amongst the possible causes which, if persisted in, undoubtedly will lead to local pelvic disorder. When the pain is chronic, however, sacral in site, and particularly when it is associated with dragging or bearing-down sensations in the abdomen, then it rises to a higher level as a diagnostic factor, and our local examination will in all probability reveal some displacement of the uterus, injury to the pelvic floor, or interference with the circulation through the pelvic organs. Pain in the nates, running down the dorsum of the thigh, will usually find its explanation in sciatica, but if other factors in the history point to recent or chronic inflammatory pelvic exudate, this pain may find its explanation in the same cause. Pain in the abdomen is next in frequency to pain in the back; and here we must determine its site, its constancy and duration, and its nature. Suprapubic pain will direct attention to the bladder, and it will remain for future examination to determine whether this organ is directly at fault, or indirectly through the mechanical pressure of the uterus or a foreign growth. Diffuse abdominal pain, accompanied by distension, suggests intra-abdominal growths or fluid or affections of the peritoneum. Pain in the iliac or ovarian regions is a frequent symptom; and this pain is more frequently situated to the left than to the right. While the local examination may reveal ovarian or obscure tubal disease, this pain is often present without adequate explanation, so that its exact value as a diagnostic factor is not settled. In character it is usually either burning or lancinating; and in the latter instance we will often be led to surmise tubal disease. In a large proportion of cases I have found pain in the left ovarian region dependent purely on chronic constipation, as evidenced by the fact that the pain entirely disappears on the patient acquiring the habit of daily defecation. The

explanation, of course, of this association of pain and loaded rectum is simple when we remember how closely adjacent to the rectum lies the left ovary, and how this latter organ will naturally suffer from the pressure of the feces and from irritation by the scybala as they pass downward. A curious point in connection with pain emanating from the ovaries is that the site of the pain not infrequently does not correspond to the affected organ. In other words, a left ovaritis is often accompanied by pain in the right ovarian region, and *vice versâ*.

Pain from both the back and abdomen frequently extends into the legs, and is to be considered as purely reflex in nature. Abdominal pain above the umbilicus will suggest, of course, organic or functional derangement of one or another of the abdominal viscera according to its site, although here as well the pain may be reflex from the pelvic organs. If, instead of pain in the abdomen, enlargement is complained of, our object should be to ascertain the length of time the enlargement has existed, in what portion of the abdomen it first began, whether it be permanent or not. The importance of these questions is apparent, particularly in connection with the differential diagnosis of abdominal tumors.

Pain in the head can scarcely lay claim to a place in the symptomatology of disease of the pelvic organs, unless it be on account of the frequency with which women complain of it. Its cause in the majority of instances is constipation or chronic congestion of the pelvic organs; and in these instances the site of the pain is usually the occiput. Rarely a hemicrania will apparently depend on inflammation of one or the other ovary, as is attested by its disappearance as the inflammation abates.

Pain in the chest, if neuralgic, may emanate from disorder of the pelvic organs, but usually this symptom will call for careful auscultation and percussion at the hands of the gynecologist, even as it would were the patient instead consulting a general practitioner. Shooting pains through the mammæ and enlargement of these organs will suggest at once pregnancy, but both these symptoms may accompany uterine or ovarian disease.

Pain in sitting should direct attention to the coccyx, or it may result from anal or rectal trouble; and the aggravation of sacral or abdominal pain in standing or walking bears testimony to the probable existence of some uterine displacement or sagging of the pelvic floor.

Pain on coitus, or dyspareunia, is a symptom which ordinarily the patient will not mention of her own accord. This symptom is a frequent cause of marital infelicity, and is therefore a sufficient justification in itself for requesting a local examination. The cause we are not always able to discover, but often, aside from disproportion in size between the male and female organs, the local examination will reveal

caruncles of the urethra, a displaced uterus or ovary, a simple hyperæsthesia at or within the ostium vaginæ, an anal fissure, or rectal disease.

From the intimate sympathetic relations between the stomach and the pelvic organs pain in the epigastric region is a frequent symptom. Obviously, this pain may depend on organic disease of the stomach, and calls for careful differentiation on the part of the gynecologist. A dyspepsia purely functional in character, however, and evidenced by either simple pain or by nausea or vomiting, will frequently be of reflex nature from the pelvis, and will suggest in the first place pregnancy, particularly if these symptoms are matutinal and before eating; and in the second place, ovarian disease. Of course these symptoms may result from mechanical pressure of some abdominal tumor on the stomach, but then there will be the further history of abdominal enlargement, and our local examination will readily detect the cause of the digestive disturbance.

Symptoms pointing to the bladder and the rectum are too frequently denied the importance they deserve. It is a fact on which sufficient stress cannot be laid that disease situated in the latter organ may, especially in symptomatology, very closely simulate disease of the reproductive organs, and the neglect of a proper appreciation of the bladder symptoms may lead the gynecologist far astray from the existing pathological factor. Whilst I cannot go so far as to say that a chemical and microscopical examination of the urine should be made in every case, the same rule will hold in gynecology as in other departments of medicine—that the history of no case is complete until such an examination has been made. Certainly, in a case at all obscure we may thus become possessed of very valuable information, and therefore every gynecologist should be informed in regard to the manner of properly examining the urine. Women, as a rule, are able to retain their urine longer than men—not that the capacity of the bladder is so much greater, but largely through the educational force of habit. Frequent micturition, therefore, is a symptom very likely to attract their attention, and it is surprising how frequently one hears the complaint without being able to formulate a cause. Mere frequency, aside from lesion of the kidneys, will usually result from mechanical pressure, perhaps of the uterus, perhaps of a foreign growth. Frequency of micturition associated with scalding suggests a variety of causes, such as some derangement of the urine, or cystitis, caruncles of the urethra or at the meatus, or fissure of the neck of the bladder. Vesical tenesmus suggests the same causes, as also, not uncommonly, a purely hyperæsthetic state of the few muscular fibres which constitute the so-called sphincter of the bladder. Sacculation of the posterior bladder wall into the vagina or the same condition of the urethra, cystocele and urethrocele, are frequent causes of trouble in micturition, owing to the irritation of the

residual urine in these artificial pouches. Calculus in the female is a further cause, giving rise to the same symptoms as in the male. It is not alone sufficient, however, to determine the frequency with which micturition is performed and the presence or absence of pain, but we must also question our patient as to the color of the urine and as to the presence of any noticeable sediment. It goes without saying that constant dribbling may mean, in the female even as in the male, hyperdistension of the bladder. If retention be complained of, especially if of recent occurrence, the thought of acute displacement of the uterus at once presents itself, and the local examination will verify our suspicion.

In regard to defecation, we should never rest satisfied with the statement that the bowels move regularly. Women have very peculiar ideas in regard to the normal performance of this function, it being no uncommon thing for this necessary demand of nature to be satisfied only at intervals of days. Our questions, therefore, must be direct as to whether the act is a complete one, as to the presence of blood or mucus in the stools, as to the presence and site of pain before or after the act, as to the regularity with which defecation is performed. The answers to these questions will frequently suggest the cause of ovarian pain previously complained of, foretell the existence of an anal fissure or rectal ulcer, and point to the presence of rectal disease which otherwise might be overlooked in our eagerness to explain the symptoms through derangement in the sexual system.

The presence of vaginal discharge next claims consideration. It is not sufficient to know that our patient has a discharge: the amount, the color, the consistency, the odor, the persistence of this discharge, are each factors of assistance in diagnosis, and direct questioning is usually necessary to obtain the desired information. The mere presence of discharge is not sufficient justification for a local examination. A certain amount is physiological, and it should ever be borne in mind that disordered conditions of the blood may give rise to a leucorrhœa, even as disease of the vagina or uterus will. In general, a discharge trifling in amount, whitish in color, of watery consistency, and odorless, will yield to constitutional measures, and in the maiden the above conditions should ever receive general treatment before subjecting her to local examination. When, on the other hand, the discharge is tinged with blood or discolored yellow, the inference is that local disease exists, such as erosion of the cervix or inflammation of the endometrium; when, again, the discharge is sticky, we may at once assume that the muciparous follicles which line the cavity of the cervix are secreting abnormally as the result of disease of the cervix; when, further, the discharge is thick and creamy and associated with painful micturition, we think of disease of the vagina, possibly of an infectious nature;

when, finally, the patient tells us that the discharge is very offensive, malignant disease or necrosis of a benign growth suggests itself. In women who have passed the menopause the source of a discharge should always be sought for locally, and, if watery and acrid, will be found to depend on atony of the vagina, resulting in the so-called senile vaginitis; if of the nature of a hemorrhage or foul, on malignant disease. It by no means follows, however, that a patient has no discharge because she says so. Certain women do not notice a discharge, and yet complain of pruritus—a symptom which of itself suggests a discharge—and the local examination will frequently in such cases reveal a leucorrhœa and its cause. If not, the urine should at once be examined for sugar, since pruritus of obscure origin not uncommonly is symptomatic of diabetes, in which event there probably exist the further symptoms of loss of weight and polydipsia.

There remain now to be enumerated those variable and varying symptoms which properly belong to women advanced in life, and which are grouped within a few years preceding and following the menopause. The pains and the aches are manifold, the hot flashes and the cold spells of frequent recurrence, and it is from the multiplicity and variability of the symptoms, taken in connection with the patient's age and menstrual history, that we are enabled to reach our diagnosis, and feel justified in applying to the symptoms that vague but convenient term, hystero-neurosis. Obviously, in these cases, a local examination will usually reveal nothing abnormal, and we should guard ourselves against making one without stronger reason than these symptoms justify; for our object should be not to attract but to distract the attention of these patients as far as possible from the sexual organs. Characteristic also of this time of life are the hemianæsthesiæ and hyperæsthesiæ, the periodical swelling of the abdomen, the lump in the throat, etc., which, while symptomatic of serious organic disorder to the patient, are readily recognized by the physician as neither of central origin nor of grave import, but as accompaniments of that functional disorder to which the old term "hysteria" must needs still be applied.

I have now outlined the method after which we should obtain the rational history, the nature of this history, and the bearing which individual factors should have in determining us toward making a local examination. If, then, the symptoms justify, we thereby proceed to obtain our physical signs, which, taken in conjunction with the rational, go to form our diagnosis and to construct our prognosis.

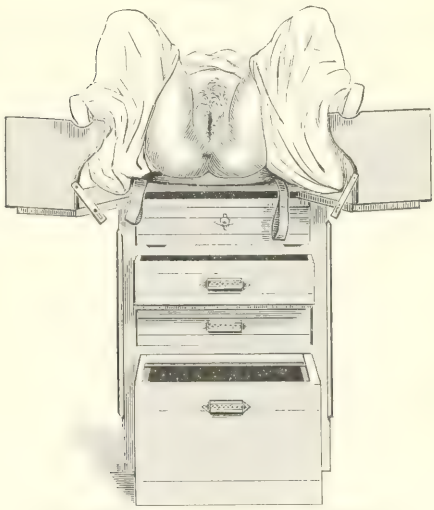
Physical Signs.

The physical signs are obtainable through the local examination. Before proceeding to this, however, it is essential to obtain what infor-

mation is possible from a study of the appearance of the patient. By this I mean to search for the signs which point to anæmia, chlorosis, acquired or inherited constitutional disease. Should the rational history have directed attention to the thoracic organs, careful auscultation and percussion should be resorted to. Such a preliminary physical examination requires but a moment's time, and yet may reveal signs which will amply explain the rational history and negative for the time, perhaps render entirely unnecessary, recourse to a local examination. The face should be questioned for the almost characteristic markings of ovarian or malignant disease. In the unmarried particularly, where the rational history or a glance at the configuration of the abdomen suggests the possibility of pregnancy, a step preparatory to requesting a local examination is inspection of the breasts—not that the absence of mammary signs should cause us to negative the possibility of gestation, but because the presence of such signs, taken in connection with the local findings, will frequently assist us in forming an opinion. In a word, the routine rule should be to obtain every possible sign before the local examination is resorted to, because we never know beforehand how simple or obscure the case may turn out to be, and in the latter instance any detail, however trivial, may be of marked assistance.

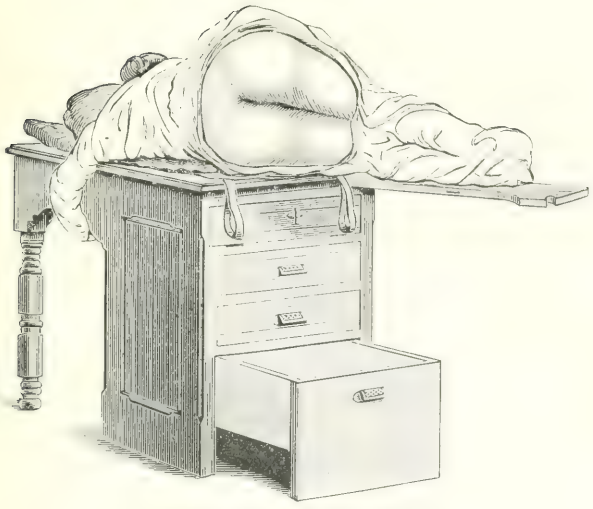
In order to make a thorough and careful local examination the gynecologist needs, above all, a properly-constructed table on which his patient may recline with comfort, and which may be readily adapted to the necessities of both the dorsal and left-lateral position. I dismiss from consideration the many complicated chairs and couches offered to the profession. These are usually needlessly elaborate, and therefore expensive. An ordinary table with gentle slope backward, provided with foot-rests and with hair mattress or other covering, of sufficient height not to strain the examiner, is the simplest and cheapest, and answers every purpose, except in the left-lateral position, where, in the absence of an attendant to hold the speculum, a lateral inclination of the top of the table is practically a necessity. Any carpenter may construct such a table, and therefore the physician, whose taste or means does not

Fig. 111.



Chadwick's Table (for dorsal position).

FIG. 112.



Chadwick's Table (Sims's position).

necessitate or allow a handsomely appointed or upholstered article, need not be deterred from possessing one of the prime prerequisites to a thorough local examination. Those who desire something handsomer,

FIG. 113.

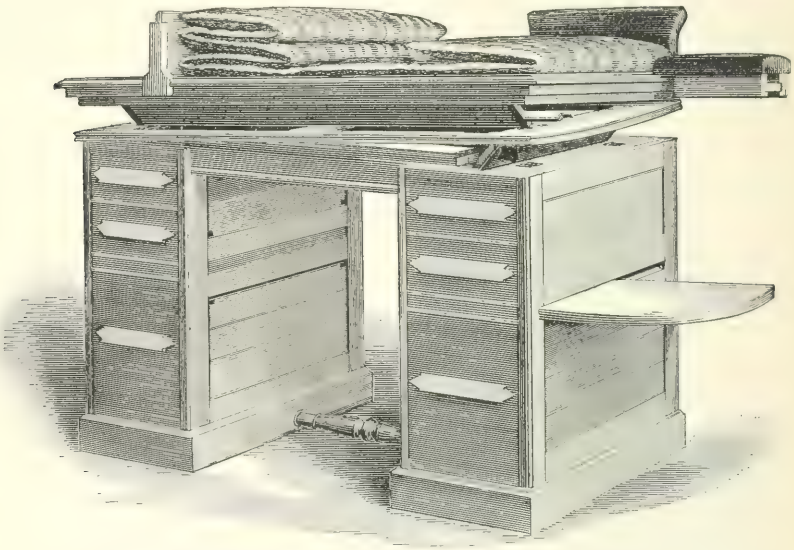
Thomas's Table as modified by Dr. B. H. Dagget for dorsal position.

however, will find the table devised by Thomas, or one of its modifications, well adapted for gynecological work. Among the best modifi-

cations[1] are those of Chadwick, of Goodell of Philadelphia, and of Dagget of Buffalo. The great objection to Chadwick's table is the lack of mechanism for obtaining the lateral inclination. It should be remembered that the office lounge or sofa is simply a makeshift, and the physician will find that it rarely requires any persuasion to induce his patient to recline on his table, provided she be assured that no unnecessary exposure is entailed.

Next in importance is the securing of the proper position, as will be noted farther on, and preliminary to the position is the loosening of the corsets and clothing, so that the abdomen may be readily accessible to

FIG. 114.



Thomas's Table as modified by Dr. B. H. Dagget (for Sims's position).

the examining hand and free play of the abdominal muscles secured. The advantage of a good light is of course obvious.

The local examination should be made in stages, so to speak, and these I shall describe separately and in succession according to the following scheme:

A. THE DORSAL POSITION: 1. Inspection; 2. Digital examination; 3. Bimanual examination; 4. Instrumental examination; 5. Rectal examination and conjoined rectal; 6. Abdominal percussion, auscultation, mensuration, and palpation.

B. THE LEFT LATERAL OR SIMS'S POSITION: 1. Digital examination; 2. Instrumental examination.

[1] A. G. Armstrong of Ashtabula, O., makes a table on the same general principles, but rather too complicated.

C. The Genu-Pectoral Position.

D. The Erect Position.

The Dorsal Position.—It is from this position that the examiner frequently secures his most important information, and the examination, therefore, should be made with the greatest possible care, since the facts noted will vary *pari passu* with the deliberateness used and the education of the examining finger. The patient should lie on her back, her head resting on a low hard pillow, her nates at the very edge of the table, her thighs gently flexed on the pelvis, her feet resting in the foot-supports. She should be covered by a sheet, and this may be raised or suitably arranged for the purposes of the first step—*inspection.* This includes the abdomen, vulva, perineum, and anus. As a routine measure it is not necessary, at the outset, to inspect the abdomen. Only where there exists obvious abdominal enlargement is it advisable to begin with inspection of this portion of the body. Usually we await the result of the digital examination, including the bimanual, before resorting to this measure, for in the large proportion of cases it is unnecessary. Should its necessity be apparent, then, in connection with inspection of the abdomen, we must frequently resort to auscultation and percussion, so that it will be more convenient to speak of this measure later in connection with the other two.

Inspection of the external genitals should, at the first examination, never be neglected. Much valuable information may thereby be obtained, aside from the necessity of the physician protecting himself against the transmission of pediculi or, above all, specific disease. The hair surmounting the mons Veneris, therefore, should be looked at, and suspicious sores sought for in every case, no matter what the social condition of our patient, before resorting to any further examination. Erythema, eruptions, the evidence of scratching, the state of the labia as regards swelling or abnormal development, are points which are quickly taken in at a glance, and suggest irritating discharge, disease of the vulva or its glands, the habit of self-abuse. The labia are now to be gently separated and the vestibule investigated. The points to be noted are, successively, the clitoris and its development; the meatus urinarius—in regard to eversion of the mucous membrane of the urethra, the presence of discharge or of caruncles; the hymen—whether intact, distended, or torn; the amount of discharge present in the vestibule—its color and consistency; the traces which parturition almost invariably leaves at the posterior commissure. It is advisable at this point to request the patient to strain or bear down, and to note the effect which this act has on the perineum and anterior or posterior vaginal wall, for thereby we are informed in regard to the tone of the pelvic floor, as well as in regard to the existence of sagging of the vaginal walls. The finger—preferably the left index, although it is

of great advantage to train ourselves to use the right index as well—should now be introduced into the vagina; and this brings me to the consideration of what may be learned from the *digital vaginal examination*.

Whilst inspection may be performed sitting, or, preferably, standing a little to the right of the patient, the digital examination can only properly be made when standing between the patient's everted thighs. The finger, previously anointed with oil—or, what serves the same purpose and is more cleanly, with soap—should ever be introduced from below upward, due care being taken not to carry along with it any of the hair which frequently profusely covers the organs of generation. It should be introduced carefully, so as to give rise to no unnecessary pain, and should note in succession the elasticity of the hymen if it still exist, the presence of spasm, the temperature of the vagina, the state of its walls whether rough or smooth, the direction of the canal, the elasticity or tone of its walls. It may be well to state that my remarks at this point concern more particularly the married, for in the unmarried a vaginal examination should, in general, be preceded by the rectal, as will be noted under that heading. The finger has now reached the upper vagina, and more space for investigation may be gained by gently but firmly depressing the perineum. The cervix is next to be examined in regard to shape, density, size, direction, length, and sensitiveness.

The majority of these factors materially assist us in diagnosis. The *shape*, for instance, will often at once suggest a cause of sterility, as where this is conical. By the *density* we differentiate the softening *en masse*—gravidity, the softening around the external os—erosion, the hard fibrous feel suggestive of advanced hyperplasia or of scirrhous cancer, the large heavy cervix accompanying subinvolution. By the *direction* we gain an idea of the probable position of the corpus uteri, which our next method of examination is needed to confirm. The position and condition of the external os are to be carefully noted, especially as to whether it be lacerated or not, and, in the first instance, as to whether the rent be unilateral or bilateral, the depth to which the rent extends, and the sensitiveness at the angles of the rent; and, in the latter instance, as to the shape of the os, parous or not, and as to the patency in degree and extent. This is all the information which the unaided internal finger can to advantage glean. It may, of course, pass to the vaginal vault, but any exact determination of the conditions there present and of the organs adjacent to it must await our next step—the *bimanual* or *conjoined examination*.

It is only in comparatively recent times that the necessity of the bimanual examination has been recognized and insisted upon. Now-a-days no examination is complete, or even approximately correct, unless this

method has been systematically used. Exceptionally only, as where there is great adipose development of the abdominal walls, inflammatory disease, or such hyperæsthesia on the part of our patient as to interfere with sufficient depression of the abdomen, is it impossible to resort to this manœuvre; and in such cases, in order to complete our diagnosis, it may be necessary to resort to anæsthesia. Otherwise, however, if the patient occupies the proper position, as already described, and the examiner makes gentle but steady pressure in the right direction, the contents of the pelvis and the topography of its contained organs may be accurately studied. To perform the bimanual, the examiner stands between the patient's everted thighs, the bladder having, if necessary, been previously emptied; places his hand, preferably the right, on the abdomen about midway between the umbilicus and the pubes, and with the fingers makes pressure in the direction of the axis of the pelvic inlet, counselling his patient to breathe quietly and to relax her abdominal muscles as much as is in her power. His external hand will thus readily come upon the fundus of the uterus, if this organ be in fair position or anteriorly displaced, or else will meet the internal finger, which should be resting in the anterior cul-de-sac. This cul-de-sac should now be explored for evidence of thickening in the vagino-vesical space, for the presence of a body which further examination must distinguish as the fundus uteri, or tumor, or, exceptionally, an anteriorly displaced ovary. If this body be continuous with the cervix, if motion imparted to it be communicated to the cervix, if further exploration posteriorly to it reveal no other body, we are assured that it is the fundus. If, on the other hand, we find another body posterior to it, in connection or separate, we immediately think of a tumor in the anterior fundal wall, loosely connected with or independent of it. Then it may be necessary, as noted farther on, to resort to the sound for differential diagnosis. If this body, however, be small and sensitive, the ovary, out of position, suggests itself. The finger in the anterior cul-de-sac should further seek for an angle of flexion formed at the junction of the cervix and body of the uterus, and should note the elasticity of the cul-de-sac and its depth. The internal finger should now pass successively to the left and right lateral culs-de-sac, the external hand bringing the organs which lie in these regions within reach. These regions are to be explored especially in regard to density, thickening, or fluctuation, suggesting recent or chronic inflammatory processes, or alterations, inflammatory or not, in the ovaries, tubes, or layers of the broad ligaments; and now, too, if the patient be spare or there be sufficient relaxation of the abdominal muscles, the ovaries may be felt if in their normal position, and they are distinguished by their size, shape, and by the peculiar sickening pain which pressure almost always will evoke. If the uterus be later-

ally displaced, the fact may be detected whilst these lateral regions are being explored. The finger should now pass to the posterior cul-de-sac, and, under favorable conditions, the abdominal walls may be sufficiently depressed to allow the external hand to meet it there. The elasticity of this cul-de-sac should also be tested, evidence of acute or chronic exudation sought for, the posterior ligaments of the uterus tested for thickening, the depth of the cul-de-sac noted, and, even as in the examination of the anterior cul-de-sac, the nature of any body differentiated as the fundus, or tumor connected with or independent of the fundus, and an angle of flexion is also to be sought for. Here, too, the sound may be necessary to make the differential diagnosis, although ordinarily the conjoined fingers will suffice. Douglas's cul-de-sac is also a favorite resting-place for prolapsed ovaries, and, as before, these may ordinarily be distinguished by their size, shape, and sensitiveness. Scybala in the rectum can only be mistaken for ovaries by the careless examiner. The next step is to test the mobility of the uterus, to estimate its size and its shape, and the relation as to direction this body holds to the cervix. The mobility is ascertained by placing the internal finger on the cervix and pushing this in various directions, or, if the uterus be not so displaced backward as to render the step impossible, the external hand may grasp the fundus and tilt it backward or forward or laterally. At the same time the shape and density of the organ are estimated, and any unevenness of its walls noted. When movement is imparted to the uterus, the examiner is to note if pain is thereby given to the patient, and as to how much the sphere of mobility is impeded in one or another direction according to the conditions present which interfere with what his experience teaches him is the usual range of motion.

It should never be forgotten, in estimating the probable relation existing between symptoms complained of and uterine position, that there is absolutely no fixed standard whereby the uterus may be judged to be in or out of position. In regard to "the normal position of the uterus" every woman is a law unto herself. The uterus has a range of normal positions, and this range will vary in each woman according, on the one hand, to the symmetry of her pelvis, and, on the other hand, to the length of the ligaments which nature has supplied to the organ to act as checks against its assuming a position which will—indeed, must—evoke symptoms. And in this word "symptoms" we strike the key-note of diagnosis of abnormal uterine position. Obviously, the uterus may in one woman lie, for instance, farther forward than in another without giving rise to symptoms from the side of the bladder; and this for the reason that her pelvis is more capacious, or her bladder less intolerant of interference, or the retro-uterine ligaments longer; and a like train of reasoning will apply to backward or down-

ward displacement. It is not sufficient, therefore, for the examiner to conclude that the uterus is ante- or retroverted in a particular case because one or another authority states dogmatically that the like position is abnormal; but he must seek farther as to whether the position which he determines will account for the symptoms. If not, the position is not abnormal for this particular woman. I would further lay stress on the fact that, ordinarily, the bimanual examination alone will tell us sufficient in regard to the position of the uterus and its mobility to render recourse to instrumental means unnecessary.

Closely connected with the bimanual are other methods of conjoined manipulation, such as vesico-rectal, recto-abdominal, vagino-rectal. The purposes of these manipulations, their indications, and the information to be thus derived will find an appropriate place under the next heading and in connection with it.

Rectal Examination.—This method of examination is repugnant alike to the physician and the patient. I cannot, as some do, consider it necessary as a routine measure. The information to be thus obtained in regard to the uterus and its adnexa is of limited nature, and never so thorough as that yielded by careful bimanual examination where the conditions are favorable. Except, therefore, where the rational history suggests rectal disease, or where the bimanual is for one or another reason incomplete or unsatisfactory, I would limit this examination in general to cases where congenital or acquired imperfections or obstructions of the genital canal forbid the methods of examination already detailed, and to virgins in order to acquire information which might justify us in rupturing the hymen for purposes of more exact diagnosis. Although, however, I restrict the necessity of a rectal examination within these general limitations, I would note here that not infrequently obscure symptoms, not explainable from the side of the uterus and its adjuncts, will be found to depend on such, in appearance, insignificant lesions as small rectal ulcer or anal fissure, even though these symptoms do not, in the least, suggest the likelihood of rectal disorder. In order to properly make a rectal examination it is essential that the rectum should have been evacuated beforehand. It will hence be often necessary to postpone such an examination until the patient's second visit, that she may prepare herself for it by an enema. The index finger, gently insinuated through the sphincter ani, will readily detect any foreign growth or stricture of the canal, and if the uterus be in fair position the cervix may be felt pressing against the posterior vaginal wall. The posterior limits of Douglas's cul-de-sac may be investigated, as well as its contents. Now, by resorting to abdomino-rectal examination the pelvic organs are depressed nearer to the rectal finger, and the posterior surface of the uterus may be palpated, as well as frequently the ovaries in normal position, and exceptionally the broad ligaments.

This last condition may be better satisfied by resorting to vagino-rectal examination, whereby a double tenaculum fixed in the cervix causes an artificial prolapse of the uterus, and thus approximates its lateral surfaces with the ligaments to the rectal finger. With the finger in the rectum an excellent opportunity is also offered for investigating the integrity of the perineal body, to be accomplished either through inserting the thumb of the same hand into the vagina, or else, as is less awkward, the index of the other hand.

A further conjoined method of rectal examination, the vesico-rectal, is of special utility in those cases where there is possible absence of the uterus, and where inversion of this organ needs to be carefully differentiated. Here it is better practice to introduce a sound within the bladder rather than the finger, for thus we obtain as exact information without risking injury to the urethra or vesical neck. We may also palpate the anterior surface of the uterus by means of the finger in the bladder, although the vagino-abdominal method, assisted, if need be, by an anæsthetic, is much to be preferred. Finally, I would allude here to Simon's method of rectal examination by means of the entire hand. This method has never become popular, and I question if to-day it is considered a justifiable procedure from a gynecological standpoint. The method requires anæsthesia, and, unless the examiner's hand be smaller than the average, the injury done to the patient is likely to be greater than any possible good which might result from the information thus obtained. I believe that through the methods of examination which I have already described a diagnosis may be reached, if one is at all possible, without resorting to Simon's procedure, and I therefore simply mention rectal exploration by the entire hand in order to condemn it.

I have now noted in succession the various methods of digital examination appropriate to the dorsal position, and have stated the general information to be thence derived. In the natural order of examination there are instrumental means of diagnosis which will be resorted to in this position before the patient assumes the left-lateral. I therefore deem it better to describe them here, rather than in connection with the description of more special instrumental measures.

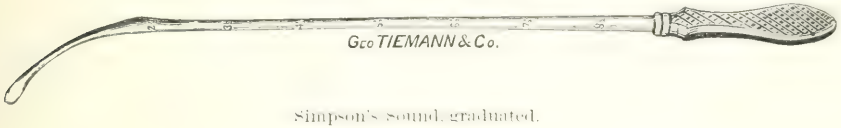
The instruments of particular utility in the dorsal position are—1, the sound; 2, cylindrical and plurivalve specula.

The Sound.—The best form of this instrument is that devised by Simpson. It is sufficiently flexible to allow of its being bent by the hand to any desired curve, and yet not so much so as to bend on itself when it comes in contact with a foreign body or is insinuated into a fold of the cervical mucous membrane. The guiding hand is therefore ever conscious of the location of the point of the sound. A further advantage is the knob marking the depth of the normal uterus, whereby the finger, along which the instrument should be passed, is

constantly informed of the progress the sound is making. The thickness of this instrument is only a disadvantage in those cases where there exists sharp flexion or congenital or acquired stenosis of the cervical canal, under which conditions, as will be noted in its proper place, the probe is to be used.

The judicious use of the sound may reveal very important information. Its injudicious use may result in serious damage to the patient. The contraindications should therefore ever be borne in mind, and these are two in number—pregnancy, peritoneal or cellular inflammation. These conditions having been strictly eliminated, the sound,

FIG. 115.



Simpson's sound, graduated.

used with care, can scarcely inflict damage. Whilst I cannot go so far as to say that no diagnosis is complete unless the sound has been used, I advise its systematic employment in every case where no contraindication exists. The instrument may, of course, be introduced with the patient in the semi-prone as well as in the dorsal position. This is largely a matter of individual choice or of habit. Personally, I favor the introduction in the dorsal position, because just previous to its use we may ordinarily assure ourselves bimanually of the position of the uterus, and are therefore better able to formulate the curve which the instrument must have and the direction it will have to take. The sound, then, held lightly between the forefinger and the thumb of the right hand, is to be introduced along the index of the left hand as a guide until it reaches the external os; passing through this along the canal to the internal os, the handle is to be depressed, elevated, or rotated according to the probable site of the fundus as deduced from the bimanual. If during its progress the point catches in a fold of the mucous membrane, the instrument is to be withdrawn and again introduced. Absolutely no force is to be used, the instrument being allowed, as it were, to find its own way. The information to be derived from the use of the sound is—the patency and size of the external os and of the cervical canal, and the state as regards smoothness or roughness of its lining membrane; the sensitiveness and the patency of the internal os; the degree of flexion; the depth of the uterus; the sensitiveness of the endometrium; the exact position of the fundus; and the general direction of the uterine axis. It is evident, therefore, that, aside from giving us information which is otherwise not obtainable, the sound will verify much which the bimanual

has taught us, and also, where the bimanual has been impossible or unsatisfactory, supplies the facts which we would otherwise lack. The value of the instrument for purposes of differential diagnosis is also apparent; as, for instance, where the bimanual has revealed a tumor in front of or behind the uterus the sound will tell us which is the corpus uteri and which the tumor. As for the use of this instrument as a uterine redressor or to test the mobility of the uterus, I most unqualifiedly condemn it. I know that in skilful hands it may be made to subserve these purposes without necessarily inflicting injury; but, knowing also that damage may be done through the purchase which the instrument necessarily takes at the fundus, I reject the sound and uniformly use one of the special instruments constructed as redressors, and which take their *point d'appui* at the external os. It will be noticed that I have not referred to the introduction of the sound through the cylindrical or the plurivalve specula. I do not favor such a procedure, because I know that the careful introduction of the instrument is best assured when the finger in the vagina acts as a guide, and also because there are positions of the uterus where these specula seriously interfere with the passage of the instrument, occasionally prevent it entirely.

The Cylindrical and Plurivalve Specula.—The uses of the speculum in the dorsal position are very limited. Indeed, I question if gynecology would ever have obtained the rank it holds had not the genius of Sims rendered evident the immense advantage offered by the specular examination made in the position ordinarily known by his name, and which I shall describe farther on. And the truth of this assertion is borne out by the fact that skill in the diagnosis and in the treatment of uterine disease, properly so called, is most marked in those countries where the dorsal position is made to subserve the purposes of the digital examination, and the left-lateral the specular. Through both the cylindrical and the plurivalve specula the field of vision is limited, the play of whatever instrument is necessary for diagnosis and treatment is narrowed and often negatived, and certain lesions of the cervix may be effaced or obscured which it is of paramount importance to detect. I need only instance the fact that laceration of the cervix is mistaken for ulceration by those examiners who habitually use these specula and the dorsal position. Hence, personally, I recommend the use of the speculum in the dorsal position solely for the purpose of making applications to the vagina or external os. For purposes of diagnosis I do not favor it at all, because the limited information thus obtainable may be secured to better advantage in the lateral position, and, at the same time, facts may be ascertained and treatment be employed which cannot be in the dorsal position. I would note here, however, that occasionally, as where the rational history suggests abun-

dant leucorrhœa, it is advisable to introduce the speculum before the finger, and then the cylindrical speculum will suffice to show us the source of the discharge.

Cylindrical specula are constructed preferably of glass or hard rubber. The Fergusson may be taken as a type, and is to be obtained in

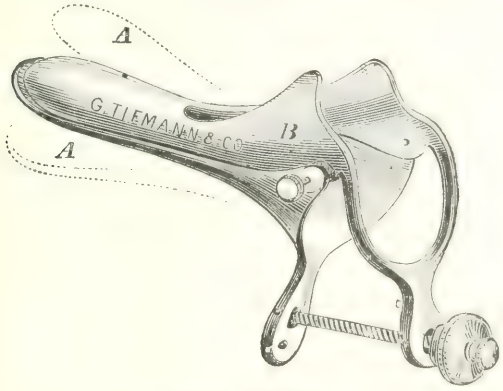
FIG. 116

Fergusson's Speculum

nests of various sizes. This speculum is readily introduced, previously anointed with oil or soap, by depressing the perineum with its point and gently insinuating it up to the cervix. If the vaginal walls be not specially lax, and if the cervix be in fair position, there is but little difficulty in engaging the external os in the field of vision. Oftener than not, however, the speculum must be withdrawn and reintroduced a number of times before this can be accomplished, and where the cervix lies far backward it requires considerable ingenuity and patience to see it at all.

Valvular specula are constructed of either two, three, or four blades.

FIG. 117.

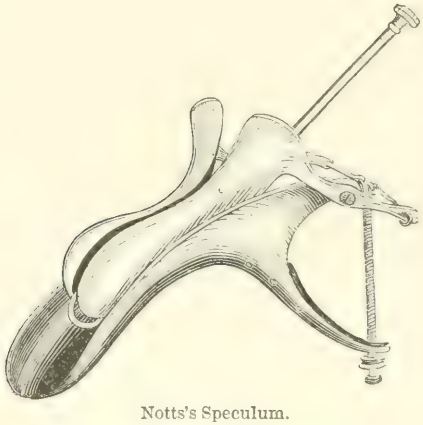


Brewer's Speculum.

Many have been invented, and each doubtless remains in favor with its inventor, although, for reasons already sufficiently stated, they are one and all inadequate for purposes of accurate diagnosis and treatment according to the requirements of modern gynecology. It is out of the question to attempt a description of the many forms here. I content

myself with mentioning, as typical of the bivalve, Brewer's speculum; of the trivalve, Notts's; of the quadrivalve, Meadows's. These specula are introduced closed and afterward expanded, and may be used in the lateral as well as in the dorsal position. It is safe to say, however, that the gynecologist who has once accustomed himself to Sims's speculum will never desert it for any form of plurivalve; and it is equally true that the general practitioner, desirous of doing something more for his patients than applying the time-honored, but to-day almost neglected, stick of lunar caustic to the cervix, must learn how to use Sims's speculum and the left-lateral position. And therefore it is why I do not deem it necessary to spend time and waste space on a description of the many forms of multivalve specula and their manner of introduction. A science should be practised correctly or not at all, and surely no gynecologist will to-day claim that he is able, through any form of multivalve whatever, to accomplish what he can through a Sims. And, whilst my remarks here are limited to diagnosis, how much more forcible do they become when applied to the treatment of intra-uterine disease! Both exact methods of diagnosis and correct methods of treatment are only possible to a limited degree through tubular and plurivalve specula. Aside from the exceptions already noted (applications to the vagina and cervix), I see no further use for these instruments, and believe that the time has come when they should be weeded out of the already too cumbersome gynecological armamentarium; and my belief is the firmer because of the fact, to be noted farther on, that the oft-repeated objections to Sims's speculum are really not tenable.

FIG. 118.



Notts's Speculum.

Since the points to be noted through the speculum appear to better advantage through Sims's than any other, their description is deferred for a time, and it remains now to consider the final diagnostic measures which properly belong to the dorsal position.

EXAMINATION OF THE ABDOMEN: *Inspection*, *Mensuration*, *Auscultation*, *Percussion*, *Palpation*.—In inspection of the abdomen we are to look for the whitish lines, lineæ albicantes, the result of the rupture of muscular fibrils and evidence of distension of the abdominal walls; we are to note the shape, whether flat on the surface and bulging in the flanks, whether round or spherical, suggesting in turn ascites,

ovarian cyst, or gravidity; we are to seek movements of the surface, suggesting arterial pulsation, fœtal motion, passage of flatus through the intestines; projection at any one portion, suggesting hernia, fibroids. These are possibilities which either our previous examination or that which is to follow will verify.

Mensuration is more particularly of service to the obstetrician. Still, in connection with the growth of abdominal tumors the gynecologist must frequently have recourse to this measure. The measurements of greatest service are those taken at the level of the umbilicus and from the ensiform cartilage to the pubes. We are thus kept informed as to the rate of growth of tumors, and may satisfactorily check their diminution under treatment or at the approach of the menopause.

Auscultation and percussion are similarly—especially the former—of greater utility from an obstetrical than from a gynecological standpoint. Not uncommonly, however, the gynecologist is called upon to make a differential diagnosis of pregnancy in its later stages, and then, obviously, the obtaining of the fœtal heart through auscultation is of essential importance. Succussion, or the splashing of fluid in the abdomen on change of position of the patient, is thus also obtainable, as well as the bruits suggestive of change in the blood-vessels or pressure upon them. Percussion is one of our most valuable means of obtaining information in regard to the nature of abdominal enlargements. The uniform and general tympanitic note, characteristic of gaseous distension of the intestines; the dull note in the flanks and tympanitic in the epigastrium, suggestive of ascites; the local dulness accompanying local tumor or distended bladder; the shading off of the dull into the tympanitic, or *vice versâ*, suggestive of tumor growing from above, or the reverse; the sense of resistance to the percussed finger, suggestive of either fluid, semi-fluid, or solid contents,—such, in outline, are the points obtainable through percussion.

Palpation of the abdomen, as already stated, is not necessary as a routine measure in gynecological practice; but when the history, appearance, or digital examination renders probable the presence of abdominal enlargement, then this measure must be resorted to; and it is essential that the patient should be properly prepared for the necessary manipulation, and that the examiner should proceed systematically and with gentleness. The bladder having been emptied, the clothing loosened, and the abdomen exposed, the examiner stands on the patient's right, and, encouraging her to relax the abdominal muscles, depresses with the tips of his fingers, gently but firmly, the various regions of the abdomen. Where, from excess of adipose development or hyperæsthesia of the abdominal walls, manipulation is impossible or unsatisfactory, then, should the necessity of palpation be obvious, recourse must be had to anæsthesia, when a tumor, otherwise undis-

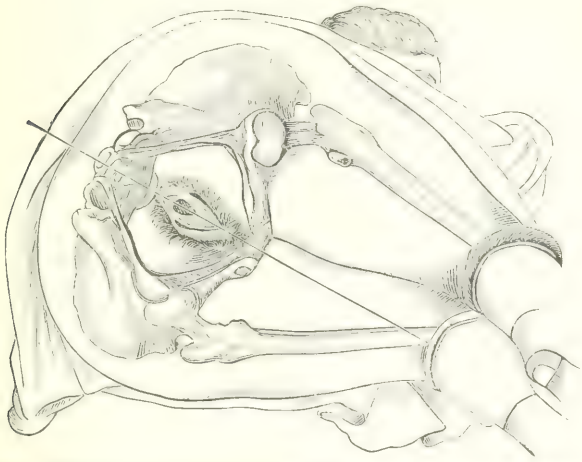
coverable, may be revealed, or else one manifest, but of uncertain nature, may disappear (so-called phantom tumor). The facts to be learned from palpation may be summarized: The probable abdominal or pelvic origin of a tumor; the density and general outline of such tumor; its single or multiple nature; its fixation or mobility; its size and depth below the surface; its probable connection with other organs; the presence of fluid, general or localized, in the abdominal cavity. Thus, then, we differentiate between abdominal and pelvic tumors proper, or simple enlargement of abdominal organs; thus we recognize a movable kidney, a multi- or unilocular ovarian cyst, subperitoneal fibroids, the gravid uterus, the uterus enlarged by cyst or new growth of solid or semi-solid nature, abscesses within the abdominal walls, hernia, aneurism: indeed, in a favorable case, the skilled examiner may often so thoroughly palpate as to be assured in turn of the probable gross condition of every one of the important abdominal organs. It is out of place to do more than refer here to the value of abdominal palpation to the obstetrician in determining the position of the fœtus within the uterus, the existence of multiple gestation, etc.

The Left-lateral Position.—Thoroughness and ease of examination in this position will depend on its being properly and exactly assumed. The position aims at bringing the force of gravity to bear on the abdominal and pelvic organs, whereby they are caused to sink downward and upward, thus tending to produce a vacuum in the vagina, which the external air, on separating the labia, rushes in to satisfy, and thereby balloons out the vagina and the vaginal vault. To obtain these conditions at their maximum the thorax must be the lowest point and the sacrum the highest when the patient is lying in this position. Even as in the dorsal position, and still more essential, the patient's clothing must be loosened from around the waist and compression of the chest-walls by the corset removed. The steps by which this position may be assumed are as follows: The patient, resting on her left natis at the edge of the examining-table to the left of the mid line, places her left arm behind her and lies down diagonally across the table, the left cheek on the pillow and the left thoracic wall against the mattress. She has thus rolled over on her chest, and the lowest point of our position has been obtained. Next, the thighs are flexed on the trunk, the right more than the left, so that the right knee projects considerably over the left, and the legs are placed at a right angle to the thighs. The pelvis has now been elevated, and the sacrum is the highest point of the position. During this manœuvre the nates are often pushed too far up on the table, so that, as a further step, it is necessary to draw them well down to the edge. The hands may now grasp the lateral edges of the table, and the patient is in position. She should be covered by a sheet, which is tucked around the superior (right) leg and thigh, the

left leg and thigh being covered by a towel, the vulva, perineum, and anus alone remaining exposed. The table should be so placed that the light may strike slantingly, from before backward, on these parts. If the table have the lateral inclination referred to in the remarks on this subject, it is obvious that the force of gravity may still further be called into play by utilizing it. This inclination, however, whilst a decided advantage if the examiner have no assistant, is not indispensable.

Before proceeding to a description of the methods of examination in the left-lateral position, it seems proper to consider very briefly the objections to this position advanced, in particular, by our transatlantic

FIG. 119



The Left-lateral Position (after Mundé, from Hegar and Kaltenbach.)

brethren. These objections are three in number: 1. There is greater exposure of the patient than in the dorsal position. 2. The change to this position from the dorsal requires extra time and trouble. 3. The use of the left-lateral position necessitates the presence of an assistant. The first objection is not founded on fact, and, even though it were true, the patient would not object to greater exposure if assured that at the same time she receives greater benefit. The truth is, that in the left-lateral position, the patient being properly arranged, the vulva, perineum, and anus are alone exposed, and these parts it is essential to expose also in the dorsal position in order to introduce a tubular or valvular speculum. The second objection—to grant for a moment that it is worthy of serious consideration—falls to the ground in the face of the assertion, not to be denied to-day, that the extra trouble simply leads to correct diagnosis and effective treatment. The third objection is, in a measure, valid. It is simply a wise precaution for the physician, when able, to have a trained assistant present to assist him

in arranging his patient and to hold the speculum. The presence of a nurse is a safeguard against blackmail, and equally so whether the patient be examined in the dorsal or the left-lateral position. It is a great convenience, too, to have some one at hand to hold the Sims's speculum, but where the amount of practice or the means of the physician do not necessitate or allow the constant presence of the trained nurse, I can affirm that he may intelligently and correctly use this instrument alone, if he but possess one of the modified forms which will be described farther on. I believe, indeed, that the above objections to Sims's instrument and position are simply, in part, the outcome of ignorance as to use and benefits obtainable—in part of unwillingness to change from routine and time-honored methods.

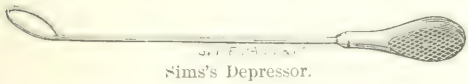
Digital Examination in the Left-lateral Position.—For diagnosis by means of the finger this position presents no advantages over the dorsal; indeed, it is decidedly inferior, seeing that the inner organs have gravitated away from the outer. For the same reason the bimanual cannot be performed satisfactorily in this position, aside from the awkwardness of the attempt. The external genitals may, of course, be inspected nearly as well as in the dorsal position, the integrity of the perineum be tested, and as for the anal region, it may be more closely examined. It is in this position that the rectum may be everted by means of a finger in the vagina, and a fissure or ulcer readily brought to view. Frequently, by means of one or two fingers, Douglas's cul-de-sac may be more carefully explored than in the dorsal position, and the nature of a post-uterine tumor better appreciated. The extent, also, to which posterior adhesions limit the mobility of the uterus may be more correctly determined, and the backward displaced uterus more effectually elevated by the finger in the lateral position. Barring these exceptions, the chief utility of this position, as intended by Sims, its originator, is the exposure of the vaginal vault by means of the speculum he devised, and which has made much of modern gynecology a possibility.

Specular Examination in the Left-lateral Position.—There is but one speculum of use in the lateral position, and this is the duckbill or Sims's. The cylindrical speculum, the various bivalves and multivalves, may, of course, be inserted into the vagina, but the disadvantages are the same as, and the advantages no greater than, have already been noted under the dorsal position. What we need in the lateral position is a perineal retractor and an instrument for depressing the anterior vaginal wall. These purposes Sims's duckbill speculum and his depressor subserve perfectly.

The chief bar to the general use of the unmodified duckbill is the fact that an assistant to hold it is practically a necessity when it is desired to introduce instruments into, or to make applications to, the uterine cavity. It is possible to perform these manipulations

alone, exceptionally, if the examining-table have the lateral inclination, the uterus be in fair position, and the vaginal walls not markedly relaxed; for under such favorable circumstances the anterior vaginal wall will gravitate upward, the depressor may be dispensed with, and

FIG. 120.



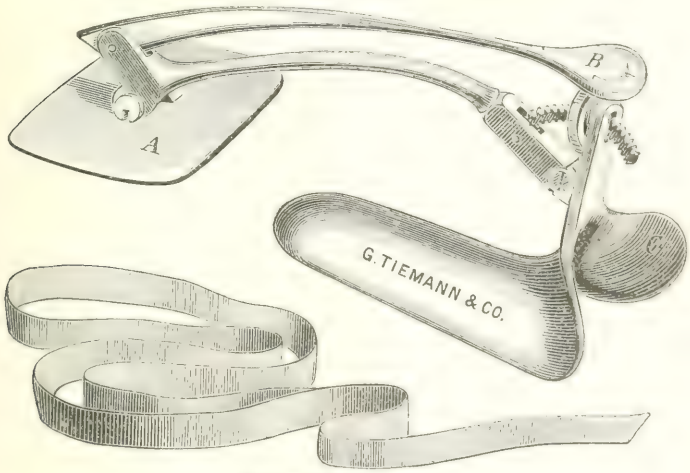
Sims's Depressor.

FIG. 121.

Sims's Speculum.

the examiner's right hand is thus left free to manipulate as he pleases. As a rule, however, if the examiner be alone, both his hands are occupied, the one with the speculum and the other with the depressor, so that he can accomplish nothing beyond getting a view of the cervix. And therefore it is that Sims's original instrument has been so variously modified, usually in order to make it self-retaining. When we consider how indispensable Sims's speculum is for both diagnostic and therapeutic purposes, and therefore how essential it is that the general practitioner, the exigencies of whose practice do not require the constant attendance of a nurse, should be able to scientifically use this instrument when using it

FIG. 122.

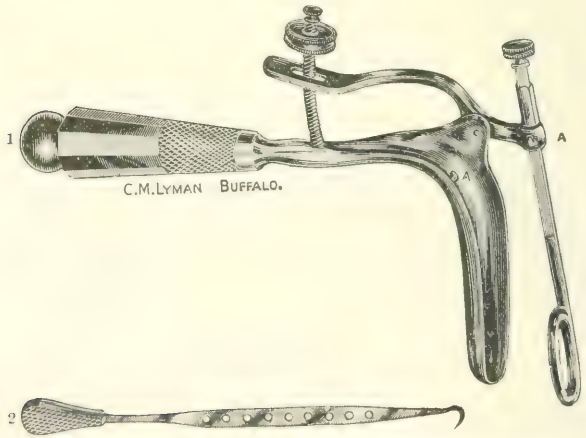


Hunter Erich Speculum.

at all, we are not slow to accord a word of praise to each gentleman who has aimed at modification, even though of all the various forms there is scarcely one which is not open to objection, largely on the score

of complexity. Without any desire to be invidious I shall refer here to only two modified Sims's which may be used to advantage without the assistance of a nurse. The one is Hunter's modified Erich, with which, although I am not personally familiar, I am assured by many gentlemen any desired manipulation is possible. It is in appearance rather complicated, but after a certain amount of practice much time is not required for adjustment. It is not possible to give a clear description of this instrument in words, and I content myself with figuring it. Another modified form of Sims's speculum, which from extensive personal experience I can recommend, is that devised by Thomas, essentially modified by M. D. Mann, and recently altered in certain respects by myself. The original instrument had a sacral-piece attached to it, and was more complicated than the later models. Mann dispensed with this piece, and at the same time had the blade and depressor lengthened and broadened. The instrument then consisted of a Sims's blade with attached depressor, this latter so articulated to the blade as *not to interfere in any way with the field of vision nor with instrumental manipulation, and—a most important point—so as not to distend in the least the ostium vaginæ*. Further, a hook (Fig.

FIG. 123.



1. Mann's Speculum. 2. Tenaculum for Mann's Speculum.

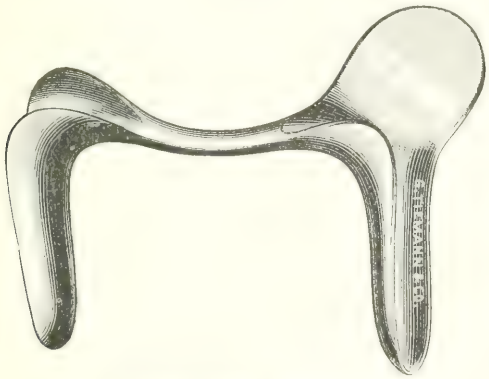
123, A) was placed on the depressor-shaft to which the tenaculum, used to draw down or steady the uterus, might be attached. This instrument is shorn of the objections common to other modified Sims's. I have recently had the instrument altered by adapting the depressor to the lower surface of the blade, fitting a flange, to hold up the superior buttock, to the upper surface of the blade, and by shortening the depressor bar. This instrument may be held by the left hand, or else, when the depressor handle has been screwed down and the handle

of the instrument removed, we have *a self-retaining* speculum, and both hands are free. I have tested this instrument faithfully, and am able with it to perform, in Sims's position, unassisted, any manipulation (applications to endometrium, curetting, etc.) proper to office practice.

Other forms of specula devised as self-retaining are those of Emmet and of Studley and Darrow. These are, however, complicated, and are apt to alarm the patient by the time and manipulation necessary for their adjustment. I believe that either through the Hunter-Erich or through Mann's speculum, or its modification, the general practitioner will be able, without an assistant, to make a correct diagnosis and apply the requisite treatment; and that there is, therefore, no longer any excuse for the halfway measures commonly, particularly in Europe, resorted to through the cylindrical or multivalve instruments.

Introduction of Sims's Speculum.—This instrument may be introduced either along the index finger of the right hand as a guide, or

FIG. 124.



Mundé's Flange Speculum.

else independently of a guiding finger. I much prefer the latter method, mainly because thereby soiling of the finger is avoided. The speculum is readily inserted as follows: The examiner, sitting on a stool or chair a little to the left of his patient, separates the labia with the thumb and index of the left hand, and, holding the speculum, previously lubricated, between the fingers of his right hand, inserts the point of the blade into the vulvar cleft and pushes the blade along the posterior vaginal wall. If care be taken to keep the blade pointing backward toward the coccyx, it will necessarily seek the posterior culde-sac and lie behind the cervix. The speculum is now to be transferred to the left hand and the perineum retracted with an upward inclination. The right hand, by means of the depressor, pushes down the anterior vaginal wall, the cervix ordinarily comes into view, and the speculum is handed to the nurse, if one be present, who holds it in

position with her right hand, whilst her left pulls up the superior buttock. This last step is rendered unnecessary if the speculum have adapted to it the flange devised by Mundé for keeping the right buttock out of the field of vision—a modification which will be found particularly of use when the nurse is desired to hold some other instrument for the examiner, and can do so in her left hand. Exceptionally, in pluriparæ with loose and flabby vaginal walls, or when from anterior displacement or distortion of the uterus the cervix lies far back in Douglas's cul-de-sac, it is impossible to obtain a satisfactory view of this organ without resorting to a further instrument, the tenaculum.

FIG. 125.

Emmet's Tenaculum.

By hooking this into the anterior lip of the cervix and making gentle traction the cervix may be brought into view. The traction must be

FIG. 126.

Sims's Tenaculum.

gentle, especially if, as a result of our bimanual examination, we have obtained evidence of, or have reason to suspect, recent or chronic cellulitis or pelvic peritonitis.

The speculum in position, we are now able to note the appearances of the cervix.

The Appearances of the Cervix through Sims's Speculum.—The chief cervical appearances to be noted are the color, shape, condition of the external os, and the discharge issuing from it. The *color* of the cervix varies from light-pink, the normal, to blue or violet, a sign of congestion and suggestive of pregnancy, subinvolution, ovaritis, mechanical interference with the pelvic circulatory system. The *shape*, unaffected by disease, may be roundish, conical, or flattened. The site of the external os, in the centre or to one side, its size, pinhole (a frequent explanation of sterility), patent to the finger (suggestive of recent miscarriage, disease of the endometrium or endocervix), fissured or lacerated (evidence of childbearing), are further points to be noted. The distinction between an erosion, ulceration, and laceration may now be readily made without the source of error referred to under the subject of multivalve specula. The eroded, everted mucous membrane of a lacerated cervix may be rolled in by tenacula, and the superficial denudation of epithelium accompanying a catarrhal erosion is clearly,

at a glance, different from the excavation the result of ulceration. The color and the nature of the discharge issuing from the external os give us an inkling of the probable main source, points already referred to under the head of the digital examination. The reaction of this discharge may be tested, and if acid will offer a valid explanation of the cause of sterility.

Introduction of the Probe.—Where, owing to narrow external os or cervical canal, or to sharp flexion, it was found impossible to pass the sound in the dorsal position, the probe—a miniature flexible sound—may now be used. It goes without saying that previous to the attempt to pass this instrument the position of the uterus has, where possible,

FIG. 127.

Emmet's Flexible Probe.

been ascertained bimanually, and that the absence of the contraindicating factors already referred to has been determined. The probe is to be bent according to the direction it will probably have to take in order to reach the fundus, and the depth of the canal may be measured and its sensitiveness ascertained, even as noted when speaking of the sound.

It is not in place to describe here the further uses of Sims's position and speculum, such as for the efficient tamponade of the vagina and the making of applications to the uterine cavity. The value of this position and speculum for the use of special instrumental diagnostic means will be noted farther on.

THE GENU-PECTORAL POSITION.—For purposes of diagnosis this position is of little value; and fortunately so, because it is a difficult position for the patient to retain for any length of time, and one particularly offensive to her modesty. Its chief uses, and very important ones, are for the thorough tamponade of the vaginal vault, and for the reposition of a displaced uterus which defies our efforts in the left-lateral position. To assume it, the patient kneels at the edge of the table and leans forward, so that her chest-wall, not her elbows, shall rest on the mattress. Obviously, gravity may now act to the greatest possible advantage, so that, when on lifting the perineum with Sims's speculum the vagina is opened and the pneumatic pressure of the air is superadded, the pelvic organs, unless pathological alterations interfere, sink upward and downward beyond the efficient reach of the examining finger. It is in this position that the length of the infra-

vaginal portion of the cervix may be accurately determined; but with this exception and the therapeutic measures noted above, the genu-pectoral position fulfils no purpose which the left-lateral may not to better advantage.

The Erect Position.—Examination in this position is attained by the patient, with legs separated, standing in front of the examiner, whilst he rests on one knee or sits, and, introducing the hand under the clothing, carries the index finger along the perineum into the vagina. For diagnosis this position is rarely available, for under usual conditions the uterus lies more horizontally, and the cervix, hence, is far back out of easy reach of the finger. In this position, however, we may determine the effect of intra-abdominal pressure on the pelvic organs, and detect downward sagging of the uterus which was not appreciable in the dorsal position, thereby finding an explanation for backache or bearing-down sensations otherwise of obscure origin.

Special Instrumental or Exploratory Means of Diagnosis.

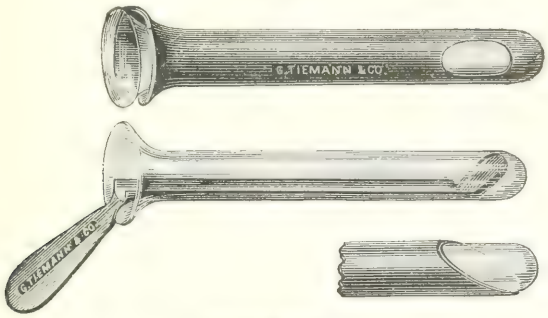
Having now considered the general and routine measures of use in the diagnosis of disease of the female generative organs, I proceed to a description of those special means, recourse to any one of which may be necessary in order to complete our diagnosis. I shall consider these measures under the following subdivisions:

A. Instrumental examination of the urethra, bladder, and rectum;
B. Dilatation of the cervix for diagnostic purposes;
C. Curetting of the cervix and uterus for diagnosis;
D. Artificial prolapse of the uterus for diagnosis;
E. Aspiration through the vagina or abdomen for diagnosis.

A. Instrumental Examination of the Urethra, Bladder, and Rectum.—The instruments at our disposal for examination of the urethra and bladder are few in number, and, owing to the limited expansibility of the meatus and urethra, the ocular evidence of disease obtainable is at best unsatisfactory. The use of the finger for purposes of exploration I must consider unjustifiable unless there is strong prospect of sufficiently relieving our patient to atone for the not impossible laceration. Ordinarily, by means of the sound—the uterine will generally suffice—we may detect the same pathological conditions as the finger could, and yet we thereby subject our patient to no risk of injury. In addition to the sound, the speculum and the endoscope are the instruments available for diagnosis, and they are best introduced with the patient in the dorsal position. The sound will determine the sensitiveness of the urethra and bladder, the smoothness or roughness of the mucous membrane, the presence of stone or of large foreign growths. Sensitiveness, varying in degree, will suggest caruncles, fissure, or

cystitis. Examination of the urine will differentiate the latter, and recourse to inspection, the former. The urethral speculum is constructed either of glass, tubular in form, or of metal, with divergent branches. Through such specula the color and integrity of the urethral mucous membrane may be noted, carunicles detected, and, exceptionally, a fissure at the vesical neck. Reflected light will greatly assist in such an examination. In the absence of a speculum the ordinary dressing-forceps or a steel-branched uterine dilator will allow us to inspect the urethral mucous membrane. As typical of the endoscope, I instance that of Dr. Skene of Brooklyn, although, except in his hands, it has not become widely used. It consists of two portions—a

FIG. 128.



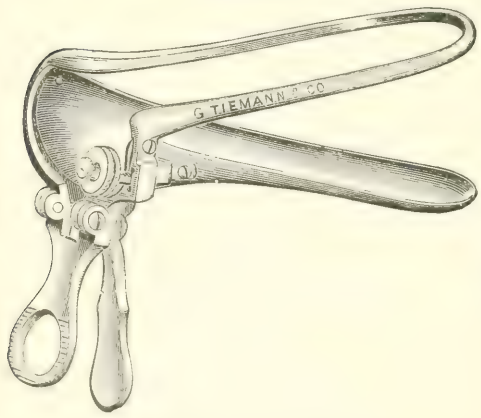
Skene's Endoscope.

glass tube and a blackened section of a cylinder containing a mirror placed at an acute angle at its distal extremity. The glass tube fits into the cylindrical section; the mirror, attached to a handle, lies in the glass tube; and when the cylinder has been introduced into the urethra light reflected from a head-mirror upon the mirror in the tube illuminates the urethral mucous membrane, and the trained eye may detect alterations within the urethra. Beyond this, whether speculum or endoscope be used, inspection extends to an unsatisfactory degree, owing to the difficulty of illuminating the cavity of an organ the walls of which constantly tend to approximate except when distended by fluid or disease. Fortunately, diseased conditions of the bladder may ordinarily be diagnosticated by means of the sound and associated examination of the urine, and therefore, from a diagnostic standpoint, it rarely becomes necessary to resort to either the speculum or the endoscope. It is in place here to refer to the possibility of sounding the ureters, and of occluding one or the other by the finger, in order to detect disease of the urinary tract above the bladder, and limited possibly to one ureter or kidney. Such manœuvres are yet in their infancy, and, whatever the possibilities for the future, up to the present have yielded no results of a practical nature.

I will simply refer here to a surgical method of diagnosis which has yielded excellent results in the hands of the originator, Dr. Emmet, and which is possibly destined to take the lead of all other methods of diagnosticating disease of the bladder and its neck. This method consists in buttonholing the urethra, and the procedure will be described in connection with the special diseases of the urinary tract.

The necessity of careful rectal exploration, in every case where the symptoms are otherwise unsatisfactorily explained, has already been insisted upon. Specular examination of the rectum as a routine measure is not necessary, but it should never be neglected in any case where there exists a suspicion of disease of the upper rectum. This examination is painful, ordinarily requires previous distension of the sphincter; and it is necessary, therefore, to resort to anæsthesia. The advisability of a thorough cleansing of the lower bowel by purgative or enema, before resorting to rectal examination, is sufficiently apparent. The general indications for a specular rectal examination are complaint of pain before, during, or after defecation and the presence of blood, pus, or membrane in the dejections, provided the signs find no explanation in the digital eversion of the rectal mucous membrane already referred to, and in the absence of such an obvious, although not always sufficient, cause as hemorrhoids. The specula of utility are either tubular or valvular. For general purposes the blade of a small Sims's will suffice for diagnosis, although a much more convenient instrument, when the examiner is without an assistant, is that devised by Kelsey of New York. The special advantage of this instrument is the fact that a large surface of the rectal mucous membrane may be inspected through it without the anus being stretched to any great degree. Whatever the form of instrument used, either reflected light, or that from one or another of the portable electric light apparatuses recently devised, is almost a necessity for exact diagnosis. The patient may occupy either the dorsal or the left-lateral position, although a better view may be obtained from the latter. The points to be noted through the speculum, some of which must escape the examining finger alone, are—the color and integrity of the rectal mucous membrane, erosion,

Fig. 129.

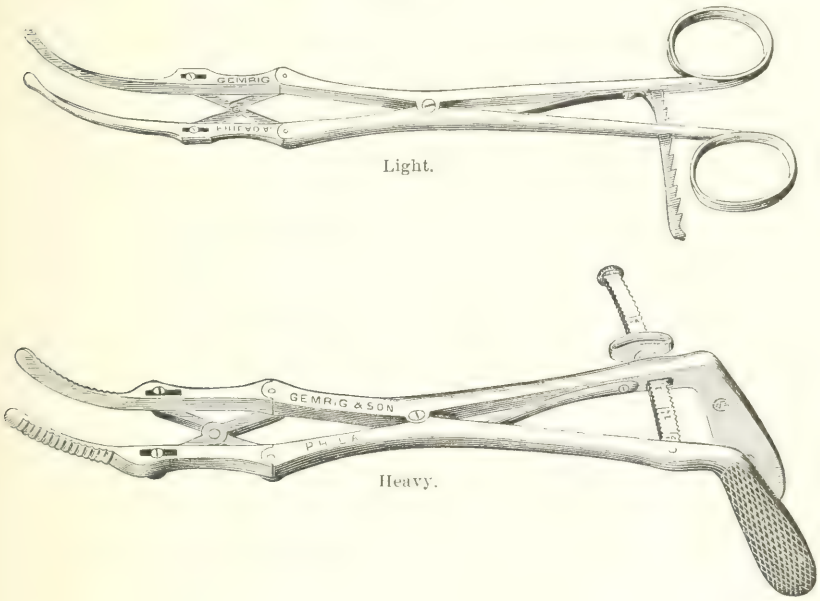


Kelsey's Rectal Speculum.

ulceration and fissure, polypi, carcinoma, and fistulous openings from ischio-rectal or pelvic abscesses.

B. Dilatation of the Cervix for Diagnostic Purposes.—In order to explore the interior of the uterus with the finger, the cervical canal must first, apart from the puerperal state, be widely dilated. To

Fig. 130.



Goodell-Ellinger's Dilators.

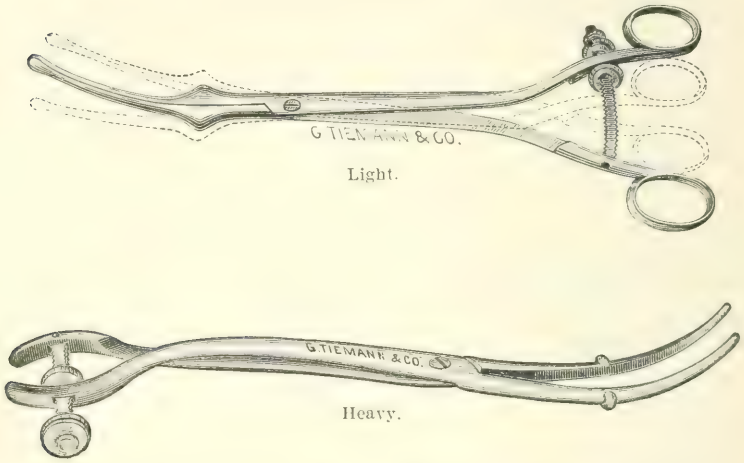
accomplish this we have at our disposal three classes of instruments: 1, steel-branched dilators and conical graduated steel or hard-rubber sounds; 2, rubber dilatable tubes; 3, tents.

The steel-branched dilators are the best agents for rapid dilatation, and will rarely fail in accomplishing their purpose, except where there exists excessive rigidity of the cervix (from hyperplasia or cicatrization). As types of these dilators I would mention that of Ellinger and that of Palmer. Ellinger's instrument is scarcely powerful enough, unless the cervix is readily dilatable, and it is also objectionable on account of the number of lodging-places for dirt it offers. Goodell of Philadelphia, however, speaks of it highly as modified by himself, and justly so, since his modification has essentially improved the instrument. He has had it constructed of two sizes—a small with slender blades, and a larger one with powerful blades which do not feather, and with a screw attachment to separate the blades. This screw-attachment is a real advantage, for thereby we are enabled to dilate slowly, allowing the muscular fibres of the cervix to yield to the applied force,

instead of rupturing them. Another excellent dilator is Palmer's. It also is furnished with a screw attachment, and it will dilate to quite one inch, sufficient to allow the average index finger to pass. The larger Goodell-Ellinger dilates to an outside width of one and a half inches.

The conical graduated sounds will accomplish dilatation as effectively as the steel-branched dilators, although they take more time, and their use has the decided disadvantage of requiring counter-pressure on the

FIG. 131.



Palmer's Dilators.

fundus through the abdominal walls; and in many cases this manœuvre fails, for the simple reason that the body of the uterus is too markedly displaced backward to be reached by the external hand. However valuable these sounds, therefore, for purposes of treatment where dilatation is desired for digital exploration, I can conceive them only of use where,

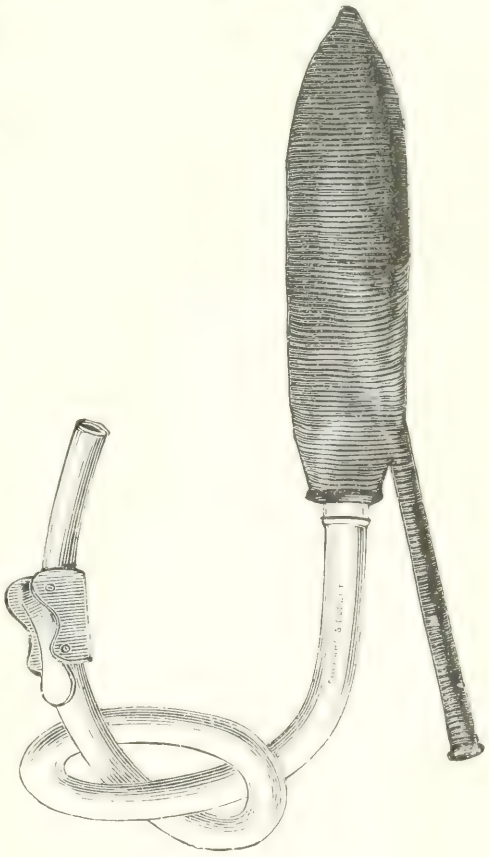
FIG. 132.

Hanks's Cervical Dilator.

through the smaller sizes, sufficient preliminary dilatation is requisite to allow of the introduction of a branched dilator. These sounds have been variously constructed and modified. The most serviceable probably, certainly as good as any others, is the set devised by Hanks of New York.

The rubber tubes, or water-dilators, are also effective dilating agents, but they are slower in action than the branched dilators, and have the disadvantage, common to all rubber, of frequently proving defective at the very time when service is required. These instruments are represented by Molesworth's and Emmet's.

Fig. 133.



Emmet's Water-Dilator.

Tents are the slowest of all dilating agents, and for purely exploratory purposes they will doubtless, in general, yield to the branched dilators, except where there is a very rigid cervix to be overcome. They possess, however, certain therapeutic uses for which they must be retained. They are constructed either of compressed sponge, of laminaria, of tupelo,—these, at least, are the sole agents of value for sufficient dilatation to allow of exploration.

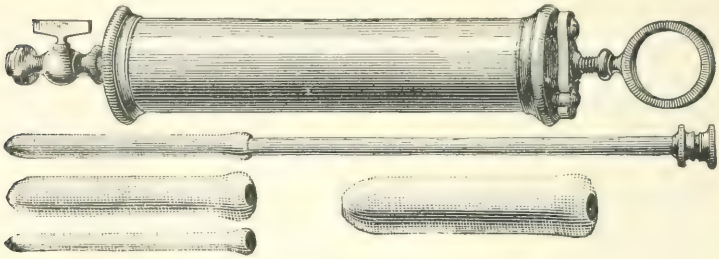
Sponge tents have long been in favor on account of their great and equable expansile power. The great objection to these tents is the fact that their use is liable to be followed by sepsis, notwithstanding careful antisepsis both in preparation and in introduction. For this reason, therefore, they are gradually being superseded by the tupelo for exploratory purposes.

The laminaria has but little dilating power comparatively, and this power is least effectual at the very point where dilatation is most desired—the internal os. This form of tent, therefore, may be ruled out as an agent of value for dilatation to be followed by digital exploration.

The tupelo (root of the *Nyssa aquatica*) is the agent *par excellence* in tent form for dilating purposes. Its expansibility is nearly equal to that of the sponge, it dilates equably throughout its length, it does not abrade the cervical tissues to the same extent as the sponge, it is excep-

tional for its proper use to be followed by sepsis. The sphere of dilatability of this tent is well represented in the accompanying cut (Fig.

Fig. 134.

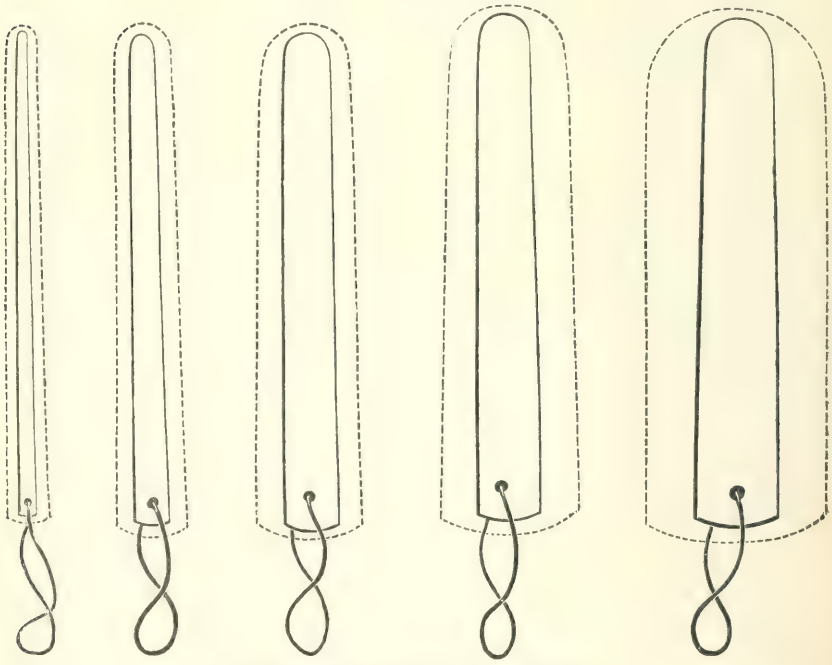


Molesworth's Hydrostatic Dilator.

135). The tupelo was introduced to the notice of the profession by Dr. Sussdorff of New York City, and may now be obtained in varying sizes and lengths, although a large one may be readily whittled to the desired size.

The indications in general, aside from therapeutic purposes, for the

Fig. 135.



Dilatability of Tupelo Tents (after Mundé).

use of dilating agents are hemorrhage from the uterus not explainable by recourse to other diagnostic means, and the necessity of ascertaining

the location and attachment of an intra-uterine growth. Dilatation sufficient for exploratory purposes should ever be considered a minor operation, requiring anæsthesia, and is to be performed at the patient's house; and after the use of any dilating agent the patient should remain in bed from twenty-four to thirty-six hours, and, as a prophylactic measure, opium should be administered and heat applied to the abdomen. In case the sponge tent is used, it is a cardinal rule not to follow the first tent immediately by another, and disregard of this rule is responsible for many a case of fatal septicæmia. The same caution is not applicable to the tupelo tent.

Ordinarily, where dilatation is desired for diagnostic purposes, the cervical canal will be sufficiently patulous to allow of the introduction of the dilating agent without previous incision of the external os. Should this be necessary, however, there is little added risk, except where a sponge tent is the dilating agent, provided due antiseptic precautions are taken before and after the operation.

From what precedes, it is apparent that I favor as dilating agents, for purposes of exploration, the steel-branched dilators where rapid dilatation is desired, and the tupelo tent in case of excessive cervical rigidity and where the slower action of the tent may be awaited. Both the dilator and the tent are best introduced through Sims's speculum, the position of the uterus having been first determined bimanually. The vagina should always first be irrigated with clean boiled water, to which carbolic acid or corrosive sublimate may be added. The size of tent suitable to the case is readily introduced by grasping it by an ordinary dressing-forceps, the cervix being steadied by a tenaculum fixed in its anterior lip. In case the Goodell-Ellinger dilator be used, the smaller size may be passed first, and dilatation by it will pave the way for the introduction of the larger size. Occasionally, independently of the puerperal state, the cervical canal may be dilated by means of the finger, and wherever possible the finger of course ranks above all other agents.

Whatever the means employed, dilatation once accomplished, the patient should lie in the dorsal position and the index finger, previously disinfected with care, is to be passed to the fundus, this in turn being depressed through the abdominal walls. We are now in a position to examine carefully the entire endometrium. Thus the finger notes the smoothness or roughness of the mucous membrane, and is able to detect the presence of any foreign body, such as a tumor and its attachment or a remnant of secundine or placenta, and we may resort at once to the necessary treatment. Our exploration ended, if no surgical procedure or application be resorted to, the uterine cavity should be thoroughly douched with hot water, plain or with the addition of some antiseptic, and in case of hemorrhage it may be swabbed

with tincture of iodine, and both the cervical cavity and the vagina tamponed.

C. The Curette as a Diagnostic Agent.—In this instrument we possess a very valuable means of acquiring information in regard to the contents of the uterine cavity and the condition of its lining membrane. There are two varieties, the sharp and the dull. For diagnostic purposes the latter alone is of use. The former has therapeutic uses which the latter can, at times, only partially fulfil. Récamier, the inventor of the curette, had it constructed with cutting edge, and therein he was imitated by Sims in his instrument. It was reserved for Thomas to devise the dull instrument and to point out the information to be derived from its use. The dull curette is made in three sizes, has a flexible shaft allowing of bending to any desired curve, and the scraping edge is smoothly flattened so as to prevent its injuring the endometrium.

Fig. 136.

Thomas's Dull Curette.

The indication, in general, for the dull curette may be said to be uterine hemorrhage or profuse leucorrhœa which yields neither to general nor to local measures, and suggests, therefore, the presence of an intra-uterine growth or degeneration of the endometrium requiring recourse to active therapeutic measures. This instrument may be used with safety in office practice, provided the object be diagnosis. Where, as the result of its diagnostic use, disease is revealed requiring resort to the more active use of the dull or to the sharp curette, then it is advisable to defer further manipulation till the patient can be seen at her house. The contraindications to the use of this instrument are exactly the same as those which apply to any instrumental interference with the uterine cavity—suspicion of pregnancy and evidence of recent exudation around the uterus. No anæsthetic is required, since the use of the curette for diagnosis is practically painless. Preliminary dilatation of the cervix is rarely requisite, because in the very cases where the curette is indicated for diagnosis the hemorrhage or leucorrhœa has softened the cervical tissues and accomplished dilatation to a sufficient degree. Where this is insufficient, however, gentle dilatation with a steel-branched dilator will allow of the passage of the smallest sized curette, which practically suffices for diagnosis alone.

The curette can only effectually be introduced through Sims's speculum, and it goes without saying that the position of the uterus should first have been determined bimanually, and the direction of its canal

by means of the sound or probe. The introduction of the curette is facilitated by hooking a tenaculum in the anterior lip of the cervix, whereby the uterus is steadied, and by making gentle downward traction the axis, in case of flexion, is in a measure straightened out. The instrument is to be given the curve which the previous introduction of the sound or probe has proved necessary, and passed to the fundus. It is held lightly between the thumb and index, and the entire endometrium is carefully but gently scraped. The sensation communicated to the fingers of roughness or smoothness of the endometrium, of inequalities in its surface, and the grating sound often audible as the instrument passes, in particular, over the cervical mucous membrane, suggest in turn possibilities even before the débris from the curetting is examined. The gross appearance of the débris, if any, will frequently make our diagnosis; as, for instance, where numerous granulations or vegetations are removed, or where, not uncommonly, a portion of the secundines from a neglected or not suspected miscarriage is brought to light. Where there is any doubt, however, resort to the microscope may reveal the structure typical of malignant disease. In case of polypus, also, the curette, presenting a broader surface than the sound, will give us more definite information in regard to its attachment. The application of the curette with care will rarely be followed by much hemorrhage; still, the better practice is to make an after-application of iodine to the endometrium, and in cases where the uterus is enlarged and heavy to tampon both the cervix and the vagina. Prophylaxis can never harm, and may do good.

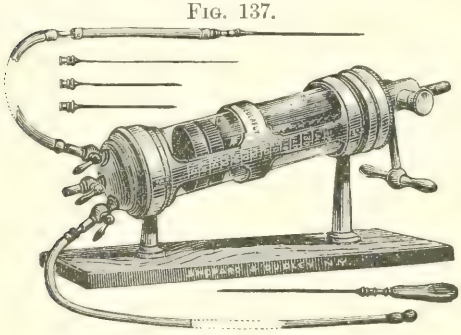
D. Artificial Prolapse of the Uterus for Diagnosis.—This diagnostic means need rarely be resorted to. The manœuvre is only indicated where the bimanual examination fails to give us exact information in regard to the nature or insertion of a tumor closely related to the uterus, and also where, owing to great adipose development in the abdominal walls, the external hand cannot depress the body of the uterus sufficiently to enable the finger, exploring its cavity, to reach the fundus. I question if it be not wiser to attempt to finish our exploration under anæsthesia, for it strikes one as crude to thoroughly dislocate any organ of the body from out of its natural position. The method is rather more in favor in Europe than with us, and apparently only exceptionally is damage inflicted. The contraindication to artificial prolapse is the presence of exudation, recent or chronic, around the uterus—a factor which of itself would prevent the success of the manœuvre, even if the attempt, under the circumstances, were not to be condemned on account of the likelihood of relighting the inflammatory process.

Artificial prolapse is accomplished by hooking a strong double tenaculum or vulsellum into the cervix, and slowly making traction

until the cervix appears at the ostium vaginæ. This accomplished, the finger in the rectum, or, exceptionally, in the bladder, may to better advantage palpate the posterior and anterior walls of the uterus, or the finger within the uterine cavity may more readily explore the fundus of the uterus. On releasing our hold on the cervix the uterus will return to its position.

E. Aspiration through the Vagina or Abdomen for Diagnosis.—We possess herein a very valuable means of obtaining information in regard to the contents, and, in a measure, in regard to the nature, of abdominal and pelvic tumors. Aspiration for diagnosis, when carefully performed, may be said to be practically free from danger, although in general it is wiser to explore at the patient's house. It is necessary to remove only a small amount of fluid; such, for instance, as may be drawn into the ordinary hypodermic syringe. The large Dieulafoy aspirator is therefore, for diagnostic purposes, not requisite. A long needle, attached to the pocket hypodermic syringe, will reach deep-seated tumors, whilst, of course, the usual needle will suffice to explore superficial tumors. A very convenient portable aspirator is shown in the annexed cut.

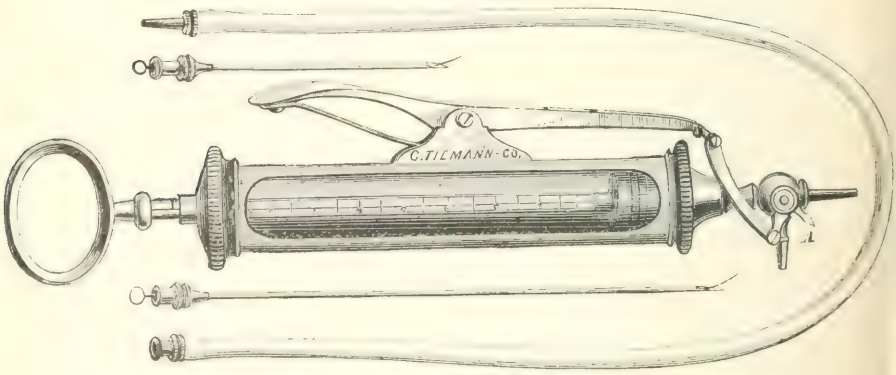
Fig. 137.



Dieulafoy's Aspirator.

Whatever the locality to be aspirated, careful preliminary disinfection should be the rule. In aspirating through the vaginal vault the needle may be passed along

Fig. 138.



Emmet's Aspirator Syringe.

the finger and thrust into that portion of the tumor where fluctuation is most distinct, avoiding, of course, a part where pulsation marks the

presence of an artery; or else the vaginal vault may be first exposed through Sims's speculum. The gross appearance of the fluid withdrawn will frequently make our diagnosis; as, for instance, where blood is obtained from a post-uterine tumor (haematocele) or pus (pelvic abscess). The differential diagnosis of abdominal tumors, by examination of the fluid removed, will usually require resort to the microscope, and even then it is still an open question as to whether the characteristics are unfailingly diagnostic of the special form of growth.

It is not in place here to describe the chemical tests to which the fluid may be subjected or to broach the subject of the "ovarian cell." Such questions will be discussed elsewhere. The point at issue will ordinarily lie between ovarian cysts, intraligamentous cysts, and fibrocystic growths of the uterus. Cystic growths of the liver and kidney may usually be recognized under the microscope by the presence, in the first instance, of degenerated liver-cells and cholesterin; in the second instance, of urea or uric acid. Hydatid cysts are recognized through the characteristic hooklets of the parasite. Finally, as pointed out by Mundé, the aspirator needle will often reveal to us the reason why an old pelvic cellulitis will not yield to routine treatment, by withdrawing a small quantity of pus situated so deeply as not to yield fluctuation to the examining finger.

GENERAL CONSIDERATION OF GYNECOLOGICAL SURGERY.

By E. C. DUDLEY, A. B., M. D.,
Chicago.

Antisepsis.

Inasmuch as the minor gynecological operations which are performed for the relief of maladies that are not often fatal, nor even always disabling, have occasionally been followed by sepsis, metroperitoneal inflammations, cellulitis, and sometimes even by death, therefore the practitioner in the hope of spontaneous recovery has often preferred palliative and temporizing measures, however unpromising, to the exclusion of surgical measures, however rational. But the application of the antiseptic principle now renders the minor gynecological operations and office manipulations comparatively free from danger.

Prophylaxis.—The essential object of antiseptic surgery is cleanliness—not æsthetic but surgical cleanliness. To secure and to maintain surgical cleanliness many antiseptic materials have been employed, of which the most generally approved is carbolic acid, but the solutions should be made with great care, lest a part of the acid settle to the bottom of the vessel, and, being pure acid instead of solution, produce a serious burn when applied. The addition of 10 per cent. of glycerin to the pure acid renders it more easily soluble. A saturated solution of boric acid or a 3 per cent. solution of salicylic acid is free from caustic properties and is an excellent antiseptic. Permanganate of potash in solution decomposes so readily than it is unreliable for antiseptic purposes. Solutions of corrosive sublimate may be conveniently made by mixing a 10 per cent. alcoholic solution with sufficient water to make the required strength, which should be from 1 : 1000 to 1 : 10,000. The stronger solutions are adapted to the cleansing of the hands and other cutaneous surfaces, and the weaker for washing the sponges during operations. Corrosive sublimate tarnishes metallic instruments and destroys their plating, but has the advantage of being odorless and in ordinary solutions of not roughening the skin. It is a most reliable germicide.

The soap, glycerin, vaseline, or oil which is usually kept by the operator's table for lubrication of the fingers and instruments may be contaminated with gonorrhœal or other virus, and may thus become a medium of infection. Neither the fingers nor the speculum, therefore, should be brought in contact with the lubricating substance unless they be free from vaginal and other secretions. The camel's-hair pencil brush and the sponge cannot be properly cleansed, and they are therefore unfit for repeated use. Absorbent cotton wound upon an applicator or stick or grasped by dressing-forceps may be used for purposes of medication or for wiping out the vagina, and should then be destroyed. No special cleansing of the vulva and vagina is required for ordinary office manipulation of these organs except the vaginal douche, which the patient usually takes before applying for treatment. If the intrauterine cavity is to be instrumentally or digitally explored or treated, it is best to wipe out the vagina with dry absorbent cotton, and then with absorbent cotton saturated with a 5 per cent. solution of carbolic acid in glycerin or with a solution of corrosive sublimate, 1 : 2000. By this means the endometrium is protected against the entrance of septic matter, which otherwise might be carried in from the vulva or vagina on the instruments. But previous to any surgical operation on the genital tract or in the abdomen the field of operation and whatever may possibly be brought in contact therewith should be rendered surgically clean, and so maintained throughout the operation and during convalescence. This treatment relates alike to the most trifling and to the most severe operations, because the former are by no means free from danger of fatal sepsis, and because a performance of seemingly minor importance in the beginning may end accidentally or purposely in opening the abdomen or in some other capital operation. Therefore, the vulva should be thoroughly and repeatedly washed with tar soap and water, and the hot vaginal douche should be applied twice a day during the week previous to operation, each douche to contain a small quantity of castile or tar soap, except the last to be given just before operation, which should be a solution of corrosive sublimate, 1 : 4000.

The ordinary practice of simply cleansing the instruments after each examination or treatment in water or soap and water is inadequate and unsafe. Æsthetic cleanliness does not absolutely destroy virus and prevent its instrumental conveyance from one patient to another. Perfect surgical cleanliness, however, may be secured in the following manner: First, let the instruments be carefully washed in the ordinary way, with hot water and soap; then let each instrument be thoroughly wiped over with absorbent cotton saturated with carbolic acid and glycerin, equal parts. To do this easily two strong forceps are needed—one in the left hand to hold the instrument, and the other in the right to hold the cotton. The instruments thus moistened with acid are now thrown into

a pan containing water which has been boiled and filtered. This water and the adherent acid make an excellent solution in which to keep the instruments during an operation. If the instruments have been unusually exposed or if they are to be used in the abdomen, it is well to render the disinfection absolute by passing them slowly through the flame of a Bunsen burner or of a spirit-lamp before applying the carbolic acid.

The cleansing and disinfection of the operator's hands and nails even after ordinary digital examination are imperative, not only to guard against the carrying of poison to the patient, but to prevent self-inoculation of specific or non-specific virus through some abrasion upon the hand.

The annoying presence of fecal matter during a surgical operation and its possible septic results may be avoided by giving the preparatory cathartic so early that its action will be complete on the day before. In order to render the sponges free from foreign and septic matter, first thoroughly beat and wash out all the sand (this may require hours of patient labor); then soak them over night in dilute hydrochloric acid, to dissolve out calcareous matter; and after washing out the acid, the sponges, which will then be much softer and more elastic, may be put away in self-sealing fruit-jars containing a 5 per cent. solution of carbolic acid or a 1 : 2000 solution of corrosive sublimate, the solution to be changed every week. The boiling of sponges is an excellent antiseptic measure, but it causes great shrinkage and hardening, and very much lessens their absorbent qualities.

The ligature and suture silk may be made thoroughly aseptic by boiling it for five minutes in pure carbolic acid, and then for twenty minutes in a 5 per cent. solution. The best braided silk thus treated may be kept for months without injury in small wide-mouthed bottles well corked, or in special ligature bottles, containing a 5 per cent. solution of carbolic acid. The braided silk is preferable to the twisted, because the latter is usually injured, sometimes destroyed, by boiling in pure carbolic acid.

The field of operation, rendered aseptic in the manner already described, may be kept so during the operation if attention be given to the cleanliness of hands, sponges, instruments, and other appliances. The occasional irrigation of the wound during the operation, and especially while it is being closed with sutures, is of great value to ensure perfect contact of the wound surfaces without the intervention of blood or other foreign bodies.

The object of after-treatment is to maintain cleanliness. At the end of the operation all particles of tissue and clots of blood should be removed and the parts thoroughly cleansed by the hot-water vaginal douche, which should be repeated every twelve hours until several

days after the removal of the sutures. After operations on the external genitalia the douche should also be given after each evacuation of the bowels or bladder.

Schroeder and other German operators employ constant irrigation during operation. This requires the patient to be in the dorsal position, and when the operation is intravaginal necessitates the use of Simon's speculum. (See Fig. 139.) Dr. Engelmann of St. Louis, in a communication to the American Medical Association, 1885, strongly advocates this method, which he has improved by the employment of hot antiseptic solutions for the irrigating fluid. He uses a hot solution of corrosive sublimate, 1 : 2000, or a 2 per cent. solution of carbolic acid made with boiled and filtered water. A special assistant, standing somewhat to the rear and to the left of the operator, manages the douche. A fountain syringe or bucket contains the fluid, which is conducted to the wound through a rubber tube five feet long, supplied with nozzle, and a stopcock to be controlled by the thumb of the hand which holds the nozzle. The opening in the end of the nozzle is one-eighth of an inch in diameter. The bucket, placed about three feet above the field of operation, gives enough force to the stream to keep all blood constantly washed away, which is to be done with an even, steady current directed just above the field, and regulated, without splashing, according to the amount of hemorrhage. The temperature of the irrigating fluid should be about 120° F. The hand which holds the speculum as the water flows over it would recognize excessive heat while the patient is under ether. The external genitalia may be guarded with lard as an additional safeguard against scorching. The urethra is especially sensitive to hot water, and should therefore be avoided in directing the stream. The hot douche by reason of its hæmostatic and cleansing properties lessens the flow of blood and keeps the parts clean, and, inasmuch as it removes all necessity for sponging, it shortens the time of the operation. The antiseptic value of the hot douche is proved by the fact that its advocates successfully employ silk sutures, which with the ordinary methods of operation often cause suppuration and failure of union.

After the sutures have been tied the wound is to be dried with absorbent cotton dusted with iodoform and covered with iodoformed cotton or gauze, to be removed in four days; then the parts should be again dried, dusted, and repacked. Two or three dressings may be required before the removal of the sutures, after that but one. Operations on the external genitals, however, necessitate the frequent renewal of at least a part of the dressing to provide for the action of the bowels and for micturition; but in such cases the hot-water vaginal douche repeated two or three times a day would be preferable to the dry antiseptic dressing.

The leading features of the German method, as modified by Engelmann, are Simon's speculum, the dorsal decubitus, the hot antiseptic douche, the absence of sponges, and the simplicity of after-treatment. The advantages claimed are greater cleanliness, simplicity, and speed.

Treatment of Septic Gynecological Wounds.—Certain natural conditions are favorable to the healing of wounds on the cervix and vagina. The opposite vaginal wall in contact with the wound excludes the air and acts as a compress, and the vagina itself is an excellent substitute for the drainage-tube. But the conditions after intra-uterine operations are less favorable, because the uterine canal is at an acute angle to the long axis of the vagina, and the cervical portion of this canal, naturally narrow, may have become narrower from disease. Therefore, secretions accumulating in the uterine cavity may not be easily expelled by force of gravity or by uterine contractions, but, on the contrary, may be confined and become infectious with inflammatory and septic results. The condition simulates that of a deep abscess at the end of a long and tortuous sinus. On general principles the therapeutic indication is clearly to cleanse the cavity and to keep it as nearly aseptic as possible by irrigation. Although this treatment is often followed by excellent results, it, unfortunately, is not free from grave objections, and often proves even more dangerous than the disease. Sometimes the stimulating presence of the irrigating fluid or of the cannula through which it is injected causes the uterine walls to contract upon the instrument so forcibly that the return flow is impeded, and the fluid may pass into the Fallopian tubes, especially if they have been dilated by disease, with grave inflammatory or septic results; moreover, intra-uterine injections without invasion of the Fallopian tubes have many times been followed by painful uterine contractions, pelvic inflammation, and death. These injections are therefore only to be employed when the canal throughout is open or can be made sufficiently open to permit free outflow, and even then with great caution. To guard against obstruction of the outflow by contraction of the uterus upon the instrument it is necessary to use some one of the double uterine catheters—Molesworth's, Nott's, or Bozemann's, for example—which have been specially devised for the purpose, and which are similar in construction to Skene's double catheter for irrigation of the bladder. Preparatory dilatation may be required before intra-uterine irrigation can be safely undertaken.

The treatment of septic wounds in the uterine cavity involves some of the vexed questions in gynecology. It is often difficult to determine whether the disease is confined to the uterus or whether the wounded surface has not rather served as an avenue through which bacteria may have passed to the pelvic cellular tissue or to the peritoneum, and there produced results which not only could not be reached by intra-

uterine treatment, but which such treatment might even exaggerate. The patulous condition of the uterine canal in puerperal cases makes the organ easily and safely accessible, and the treatment therefore more effective. The most efficient antisepsis in purely surgical gynecology is generally prophylactic.

Opium, Quinine, and Ice.

In addition to antisepsis certain other precautions against cellulitis, peritonitis, and metritis should be enforced, especially in cases predisposed by a previous attack. Preparatory to operation the patient may be fortified by full doses of quinine, and for two or three days after the operation this should be continued and supplemented with opium to control pain, and with the ice-bladder over the hypogastrium. The thin gum rubber ice-bladder is most convenient, but the ordinary sheet gum rubber two feet square, such as dentists use for the rubber dam, may be substituted by gathering up its sides and corners above the ice and tying them with strong twine. To prevent the annoying condensation of water on the outside of the rubber bag another piece of rubber or oiled silk should be wrapped about it. Great reliance may be placed upon opium, quinine, and ice, not only for prophylaxis against inflammation, but also as a remedy in the acute stage. Ice is much more certain in its results than the time-honored and conventional hot flaxseed poultice.

When to Operate.

It may be urged as a general, though by no means a universal, proposition that the female genitalia should be exempt from all interference during menstruation. For example, it would be unwise to operate for laceration of the cervix or perineum or for vesico-vaginal fistula during menstruation. But when menstruation is so long continued or so profuse as to endanger health or life, immediate interference may be demanded. Indeed, it has not been proved that operations are decidedly more dangerous in the menstrual than in the intermenstrual period. The presence of the menstrual fluid, however, is unfavorable, though not usually disastrous to union by first intention. An operation if performed immediately upon the cessation of the flow might cause it to reappear, and if too near to the anticipated period it might excite premature menstruation. The best time, therefore, is between the third day after the cessation of one period and the tenth day before the anticipated appearance of the next.

The question of primary or secondary operations after the puerperal lacerations has been much discussed. Emmet's operation for laceration of the cervix should be delayed until after the puerperium, though a

few cases of the immediate operation successfully performed have been reported. For laceration of the perineum, however extensive, the immediate operation is desirable for two reasons: The torn parts can be accurately adjusted to their former relations, which is almost impossible in the secondary operation; and the operation if well performed generally results in union, and thereby protects the patient against septic infection through the torn surfaces. The writer therefore would advise the primary operation of perineorrhaphy even as late as two days after delivery. He has repeatedly operated on the second and third days, and once on the ninth, and with scarcely an exception the delayed operation has resulted in satisfactory union. If, however, the primary operation has been delayed for a number of days, it is best before introducing the sutures to denude with the curved scissors a narrow strip all around the torn surfaces, in order that fresh surfaces may be brought together. A delay of a few hours after delivery ensures greater freedom from capillary oozing from the torn surfaces, which sometimes occurs after closure of the wound and which may prevent union; and moreover, if anæsthesia be required, it is better to wait for permanent retraction of the uterus, otherwise the anæsthetic may cause relaxation and consequent uterine hemorrhage.

It is the duty of the accoucheur at the close of the puerperium to examine the uterus, vagina, and perineum, and to repair any puerperal laceration or injury before its evil results have developed. Operations may be necessary, therefore, during lactation. The child should be kept from the breast only until the mother has fully recovered from the anæsthetic.

Operations during pregnancy should not be undertaken save in rare cases in which the life or health of mother or child is seriously involved. Matthew D. Mann[1] of Buffalo has collected 90 cases in which gynecological operations have been performed on pregnant women; of these, abortion followed from the operation in 20 cases; and of these 20, only 4 died. His conclusions, which, as he says, may or may not be verified by further observations, are as follows:

"1. Pregnancy is not so decidedly a bar to operation on the pelvic organs as is generally supposed. The results, however, vary with the operation and the organ operated upon.

"2. Union of denuded surfaces is the rule, and the cicatricial tissue formed during the earlier months of pregnancy is strong enough to resist the shock of labor at term.

"3. Operations on the vulva involve very little danger either to mother or child.

"4. Operations on the vagina are likely to cause severe hemorrhages, but are not otherwise dangerous.

[1] *Gynecological Transactions*, 1883, vol. vii.

"5. Venereal warts and vegetations of large size and non-syphilitic are best treated by removal, whether they occur in the vagina or are confined to the vulva.

"6. Applications of nitrate of silver and astringents of this class may be made with safety to the vagina and cervix. Diffusible poisons, like carbolic acid or iodine, should not be used pure or in strong solutions for such applications.

"7. Operations upon the bladder and urethra are not dangerous or likely to be followed by abortion.

"8. Operations on the rectum involving the sphincter ani, even if slight in their character, are dangerous.

"9. The operation for vesico-vaginal fistula should not be undertaken during pregnancy, as the dangers of hemorrhage and abortion are considerable.

"10. Plastic operations on the cervix and perineum may, if necessary, be undertaken in the earlier months of pregnancy with a fair prospect of success, and with a good chance that the results may not be impaired by labor.

"11. Small polypi of the cervix may best be treated by torsion or strong astringents. If cut, there is some danger of abortion following.

"12. Large polypi may, if causing hemorrhage, be removed at once, with a fair chance of good results. If not doing any harm, then removal is best left until near the close of pregnancy.

"13. Cancer of the cervix discovered during pregnancy should, if possible, be removed at once."

The possible necessity implied in the tenth proposition, which would demand a plastic operation on the cervix or perineum of a pregnant woman, must be extremely rare.

Two or more gynecological operations may safely be undertaken at one time if the patient be in good condition, if the operations do not conflict one with the other, and if the operator be rapid and dexterous. Trachelorrhaphy and perineorrhaphy, and sometimes trachelorrhaphy, anterior elytrorrhaphy, and perineorrhaphy, are permissible at one sitting. Trachelorrhaphy and the operation for hemorrhoids are often combined. The author has frequently operated for laceration of the perineum and for hemorrhoids at the same time, and always with satisfactory results. When operations on the cervix and anterior vaginal wall are combined with perineorrhaphy, the cervical and vaginal sutures must not be removed until the fourth week, when the perineal union will be firm enough to withstand moderate distension of the vulva by the speculum. Trachelorrhaphy should not be combined with curetting, dilatation, incision, or with any other intra-uterine operation, because operations on the uterus, especially on the interior of the uterus, are peculiarly liable to be followed by metro-peritoneal inflam-

mation and sepsis, and because trachelorrhaphy would interfere with free drainage of the secretions from an intra-uterine wound, and would thereby increase the danger. Moreover, an accumulation of coagulated blood might be forced by uterine contraction through the closed cervix and thereby destroy the union.

During epidemics of infectious or contagious diseases operations on the female genitalia are prohibited by the increased liability to sepsis and pelvic inflammations, and if possible should be avoided; nor should they be undertaken while the patient is suffering from any acute disease. The immediate operation of perineorrhaphy, for example, usually fails if closely followed by inflammation of the mammary gland.

The occasional necessity for surgical interference during the acute stage of pelvic inflammation justly excites the greatest fear, yet the dread of such interference is sometimes exaggerated. The septic and inflammatory results of a gangrenous intra-uterine fibroid or of the secundines of an abortion might be vastly more dangerous than the operation for their removal.

Preparatory Treatment.

Syphilis, gout, rheumatism, Bright's disease, purpura, or faulty nutrition from any cause may prevent union, and may therefore require constitutional tonic and hygienic treatment preparatory to operation.

In the presence of a periuterine exudate and thickening, with fixation of the uterus, which always persist for a variable time after pelvic cellulitis and peritonitis, it is safer to defer all surgical operations until time and treatment have reduced the products of inflammation and the periuterine tenderness to a minimum, and until the mobility of the uterus has returned. While the slightest trace of a former cellulitis or peritonitis exists, an operation, however trivial, may result in a fatal recurrence of the inflammation. In such conditions, therefore, it is a safe rule to delay operation. Dr. H. C. Coe,[1] on the other hand, has shown that old chronic thickenings are not always the material products of inflammation, but may be the simple result of cicatricial contractions following local peritonitis, and that they are not a positive contraindication to operation.

The objects of local preparatory treatment are not only to remove the products of inflammation, but to render the field of operation as free from disease as possible. A lacerated cervix in a state of granular erosion and cystic degeneration, or a vesico-vaginal fistula encrusted with phosphatic deposits, would not give the greatest promise

[1] "Transactions of the Woman's Hospital Alumni Association," *American Journal of Obstetrics*, February, 1886.

of union by first intention. Therefore, the hot-water vaginal douche, iodine applications, the daily tampon of absorbent cotton saturated with pure glycerin or glycerin combined with alum, tannin, or iodoform, and the puncturing of retention-cysts, may be required for many weeks before the cervix is in a condition favorable for union. The fistula may require long and patient vaginal dilatation before its edges can even be approximated. But sometimes the induration, fixation, and periuterine tenderness do not yield to the usual treatment of hot water, glycerin tampons, iodine, and rest; numerous cases of granular erosion of the cervix are not influenced by topical applications, however long continued. In some cases neither the general nor the local condition can be materially improved except by a successful plastic operation; then the gentle and rapid manipulations of an expert operator may result in less injury to the nervous system of a debilitated patient, in greater freedom from inflammatory reaction, and in more satisfactory union, than an inexperienced operator could secure under more favorable conditions.

Emmet recommends a hot vaginal douche of 120° F. to be given for thirty minutes just before an operation. This is for the double purpose of cleansing the vagina and of so constricting the capillaries that hemorrhage from denuded surfaces may be partially prevented. Just before giving the anæsthetic the operator should make a careful examination by conjoined manipulation to satisfy himself that the patient is free from cellulitis or peritonitis which may have become active since the examination.

The dress of the patient should be such as would ordinarily be used in bed, and should be supplemented by open drawers, stockings, and a flannel blanket. The night-dress may be drawn up about the waist to protect it from blood, and a large folded towel or sheet may be placed under the patient's hips to keep the blanket which covers the table from being soiled.

Operation-Table.

The operation-table should be approximately 48 inches long, 24 inches wide, and 27 inches high. The ordinary kitchen table or narrow dining-table, with the leaves down, covered with a blanket or quilt, fulfils all the requirements. Greater length is objectionable, because when the thighs are flexed and the hips drawn toward the operator, the head should be near to the anæsthetizer, who stands at the end of the table opposite the operator. A chair or stand may be placed temporarily for the feet while the patient is being etherized. The bed is too low, too yielding, and too large for operative purposes. An operation-table specially devised for hospital practice should have attached at the end a copper or porcelain basin, into which the water

may flow should it be necessary to wash out the bladder or vagina during operation or to operate under the hot antiseptic douche.

Anæsthesia.

The principles which apply to anæsthesia for surgical purposes in general apply also without change for the operations of gynecology. Sulphuric ether is safer than chloroform, and should therefore be preferred, however short the operation may be. In exceptional cases complete anæsthesia by ether proves very difficult or impossible. The Vienna mixture, composed of one part alcohol, two parts chloroform, and three parts ether, may then be substituted until anæsthesia is complete, when the ether should be resumed. Emmet has pointed out that when the kidneys are not sound, chloroform is much safer than ether, and should therefore always be used under such conditions.

The hydrochlorate of cocaine used hypodermically at or as near as possible to the field of operation, in doses of one half grain or more, produces perfect local anæsthesia of short duration, which may be prolonged by repeating the dose. Many of the minor gynecological operations, such as curetting, dilatation of the uterine canal, division of the cervix, and unilateral trachelorrhaphy, may in this way be performed with little or no pain. The maximum dose of cocaine has not been fixed, but it has been given in doses of several grains. As a local anæsthetic it is more reliable when used hypodermically than when brushed over a mucous or cutaneous surface. Intolerance by idiosyncrasy has occasionally been observed, but the possible dangers of the drug are unknown. A 4 per cent. solution sprayed over the Schneiderian membrane has caused alarming symptoms.

Materials for Sutures.

Silk, catgut, and silver[1] are the materials most commonly employed for sutures in gynecological operations; each has its peculiar advantages and disadvantages; neither is universally to be preferred.

Silk.—The braided absorbs less moisture and is superior to the twisted silk both for sutures and ligatures. The best braided silk is that of Archibald Turner & Co. No. 7 is suitable for sutures in plastic operations on the perineum, vagina, and cervix, but it is too heavy for the ligation of small vessels. Silk sutures and ligatures, if rendered thoroughly aseptic according to the directions given in the section on Gynecological Antisepsis, will remain aseptic for four or five days, and

[1] Silver-plated copper-wire, which is quite as good as pure silver for plastic operations, can be obtained of Codman & Shurtleff, Boston, at about one-eighth the cost of silver.

if protected by aseptic dressings—which in gynecological work is not always possible—they may remain clean for a week, but after that, in consequence of their absorbing qualities, they are liable to become septic and to cause suppuration. Sutures and ligatures of silk in the abdominal cavity, however, do not become septic or produce suppuration if the operation has been aseptic, and they may therefore be left permanently, being more reliable than catgut.

Catgut, if aseptic when used, is less liable to produce suppuration than silk; it usually disappears by absorption in four or five days—makes an excellent ligature for small vessels in plastic operations, in which it may be cut short and the wound closed over it. Catgut sutures are useful also for operations on the vaginal wall or cervix when performed in connection with perineorrhaphy, because they disappear in a week by absorption, and thereby obviate the necessity of distending the recently-united perineum for their removal. But the absorbability of catgut may cause it to disappear too soon, and the wound then, deprived of needed support, may reopen. To guard against this, Lister advises that it be soaked for thirty-six hours in a mixture of chromic acid 1 part, carbolic acid 200 parts, and water 4000 parts, and then dried. Just before using it should be moistened with carbolic-acid water. M. D. Mann of Buffalo, after considerable experience, says that catgut prepared in this way gives little or no trouble from too rapid absorption.

The silver suture, with which Marion Sims demonstrated the curability of vesico-vaginal fistula, is most frequently employed for gynecological plastic operations in the United States. It is specially adapted for plastic surgery, because it cannot by the absorption of moisture become septic and produce inflammation and suppuration, with consequent swelling and strangulation of the included tissues. It is indeed not likely to cut through or to cause strangulation, even though left in place for a month. No. 26 silver wire is generally recommended for perineorrhaphy, No. 27 for trachelorrhaphy, and No. 28 for vesico-vaginal fistula; but the heavy No. 26 wire is less liable to cut, gives better support to the wound, and is generally suitable for all plastic gynecological operations.

Comparatively speaking, aseptic silk or catgut sutures may be used for any plastic operation, and in the hands of a skilful operator they usually prove satisfactory; but the former become septic in a few days, and the latter may be absorbed too soon; either material, therefore, is less reliable than silver. Silver sutures are generally to be preferred in plastic operations, and especially in operations which require them to be left for more than six or seven days, or after which there may be traction on the sutures or a tendency to gaping of the wound. Such operations include trachelorrhaphy, vaginal fistula, and the extravaginal portion of colpo-perineorrhaphy. But in the intravaginal portion

of colpo-perineorrhaphy silk or catgut is preferable to silver, and catgut is specially applicable to the vaginal portion of Emmet's new operation of perineorrhaphy. For trachelorrhaphy silver sutures are preferable even when the perineum is closed at the same time, because in uterine tissue they do not cause suppuration even if left for three or four weeks, when the new perineum will be firm enough to permit the careful passage of the speculum for their removal.

Assistants.

Four assistants are usually required for a gynecological operation—one to give ether, one to wash sponges, one at the operator's left to hold the speculum, and one at the operator's right to sponge and render other assistance. If the operation be on the perineum or vulva, and the patient be in the dorsal decubitus, the thighs must be flexed and held in the lithotomy position by the two assistants on the right and left. The assistants in charge of the ether and sponging should be physicians. The washing of sponges and holding of the speculum may be done by nurses. The occasional occurrence of acute synovitis in the knee-joint following operations on the perineum was unexplained until Dr. E. H. Webster of Evanston, Illinois, suggested that while holding the thigh in the lithotomy position an assistant by carelessly throwing his own weight upon the patient's leg or by leaning heavily upon it might flex the joint to a dangerous degree. Various contrivances have been devised for holding the legs when in this position, but they are unnecessary.

Miscellaneous Instruments.

When the field of gynecological diagnosis and therapeutics was chiefly confined within the circumference of the cervix uteri, the various cylindrical bivalve and polyvalve specula were seemingly adequate to the needs of the practitioner; but the development of surgical gynecology, especially that relating to the puerperal lacerations and other injuries, dates from the invention of the perineal retractor of Marion Sims.

In the United States, Drs. Sims and Emmet with Sims's speculum, the latero-prone or Sims's position, and the silver suture gave to plastic surgical gynecology its greatest impulse. Then Gustav Simon and his followers in Germany with a modification of Sims's speculum, the dorsal position, and the silk suture popularized the operative method now almost universally adopted throughout Germany.

Sims's Speculum.—In order to appreciate the action of Sims's speculum it becomes necessary to study the effect of the latero-prone or

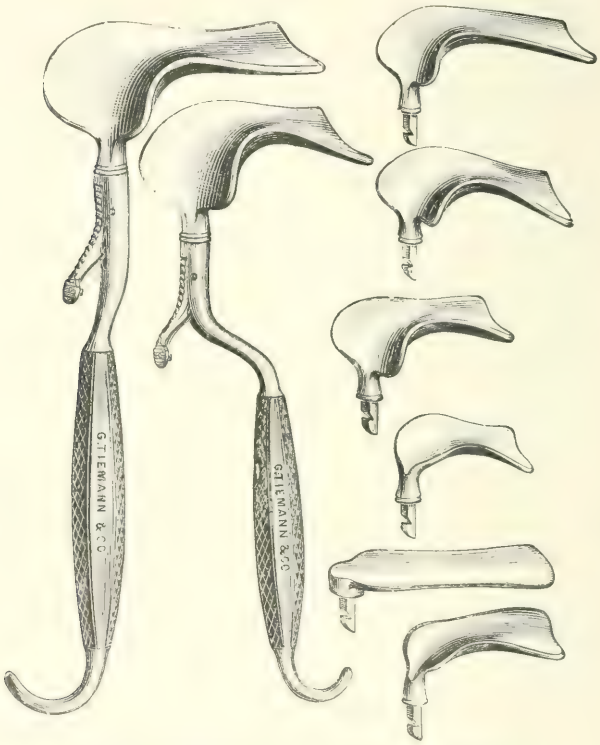
Sims's position upon the pelvic organs. Like the knee-chest position, of which it is a modification, it causes the vagina to fill with air, and the anterior and posterior vaginal walls—or, to speak more comprehensively, the pubic and sacral segments of the pelvic floor—to separate. The speculum then exaggerates the effect of this position by hooking or drawing back the perineum, which exposes almost the entire surface of the widely-opened vagina, and causes the cervix to be drawn somewhat forward toward the vulva. Two requirements are essential to the successful use of Sims's speculum—correct position of the patient and proper holding of the instrument. The patient is to be placed on the left side, the hips being over the left-hand corner of that end of the table which is toward the operator; the knees are to be drawn up toward the abdomen, and the right thigh flexed slightly more than the left. The left arm then rests behind the patient on the table. This permits the right shoulder to be thrown forward and depressed toward the right side of the table, so that the position becomes latero-prone—*i. e.* lateral and slightly prone at the hips, and almost wholly prone at the shoulders. The left side of the head rests upon the table, the face looking to the right. The right arm hangs over the right side of the table, and the long axis of the trunk extends obliquely across the table from left to right.

Modifications of Sims's speculum to make it self-retaining and to dispense with the assistant have been devised by Emmet, Studley, Hunter, Erich, and others, but, for surgical purposes at least, with but imperfect success. Proper holding of the instrument and correct position of the patient will secure more light and space than can be gained by any other means. A detailed description of the manner of using Sims's speculum will be found in the article on "Gynecological Diagnosis." For surgical operations or explorations in the rectum Sims's speculum and Sims's position are incomparably superior to all others.

Simon's speculum (Fig. 139) is a perineal retractor similar to Sims's, but with shorter and flatter blades, which are made of different shapes and sizes, and are adjustable on a handle, so that they may be changed to meet the requirements of the case. It is the favorite instrument of the Germans, and differs from Sims's chiefly in the manner of its use, which requires the patient to be in the dorsal decubitus and the thighs to be flexed as in the lithotomy position. An objection to the instrument is the greater liability of the vesico-vaginal wall to fall down toward the speculum and of the lateral walls to fall together, and thereby to obscure the field of operation. To obviate this, Simon uses a smaller though similar retractor which acts in the opposite direction, like the anterior blade of the bivalve speculum. Lateral depressors also are often required on either side, all of which are more or less in the operator's way. Moreover, the introduction of the sound, curette,

or of other instruments to the interior of the uterus is more difficult in the dorsal than in Sims's position, and if the organ be anteverted or anteflexed the instrument is especially liable to be arrested at some point on the posterior wall of the cervix or at the internal os, and refuse to pass farther. Sims's speculum is more easily held, requires fewer assistants, fewer attachments and depressors, than Simon's. It gives the maximum amount of light and space, and therefore probably never will be superseded by any other instrument.

Fig. 139.



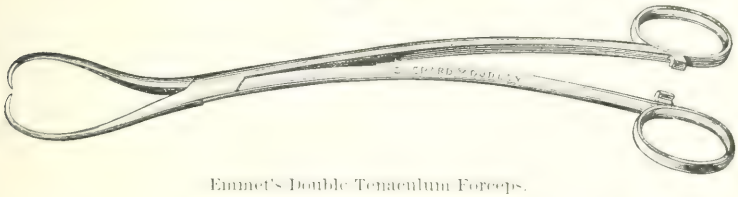
Simon's Specula: blades of various sizes and shapes.

Vulsellum forceps, similar in construction to those shown in Fig. 154, but with heavier blades and longer teeth, are designed for various operations on and about the cervix. They are used for holding the cervix during amputation and for making traction in the removal of a uterine fibroid. Emmet's double tenaculum forceps (Fig. 140) answers the same purpose. It is well adapted for the removal of any intra-uterine mass requiring traction; its teeth lap one over the other when closed, which adds materially to the strength of their grasp; its blades and handles are bent in opposite directions with a sigmoid curve, so

that it may be out of the operator's way when held by an assistant.

Emmet's double tenaculum is used for steadying the uterus during amputation of the cervix or during intra-uterine operations. It is held

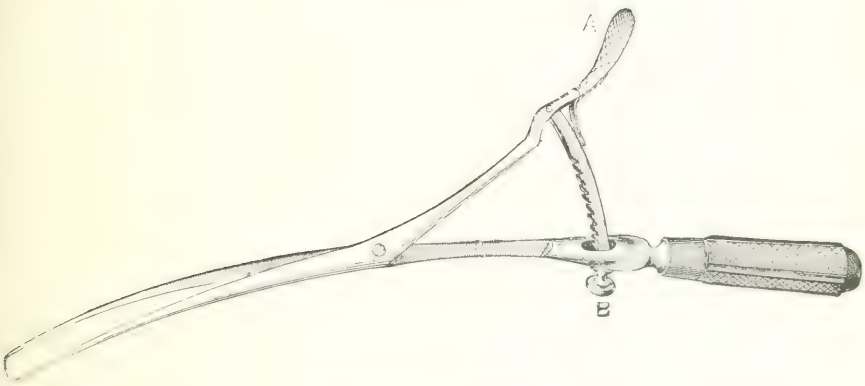
Fig. 140.



Emmet's Double Tenaculum Forceps.

in the left hand, and may be introduced into the cervical canal with its teeth adjusted, as in Fig. 141; then by depressing the thumb-piece at *A* the blades are widely separated, the canal put upon the stretch, and its opposite walls penetrated and held by the teeth. Its hold upon the

Fig. 141.



Emmet's Double Tenaculum.

tissues may be loosened by drawing back the ratchet at *B* with the index finger.

Sponge-Holders.—For intravaginal operations three or four or more

Fig. 142.

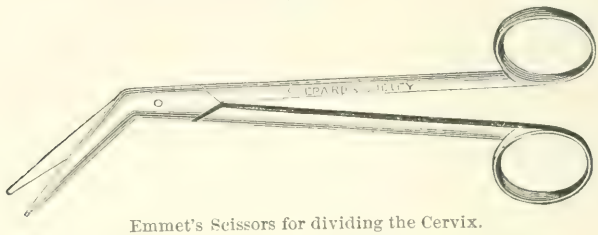
Sims's sponge-holder.

sponge-holders (Fig. 142), twelve inches long, are usually required, in which sponges trimmed to the desired size and shape may be fastened.

Scissors.—The minor gynecological operations may be performed either with the scissors or with the knife, and the choice depends much

upon the education and habits of the operator. The scissors certainly cause less hemorrhage, and when one becomes accustomed to their use he can work more accurately and more rapidly. Any strong, well-made, slightly curved scissors will suffice, but those of Emmet are specially adapted to intravaginal, perineal, and vulvar operations.

Fig. 143.

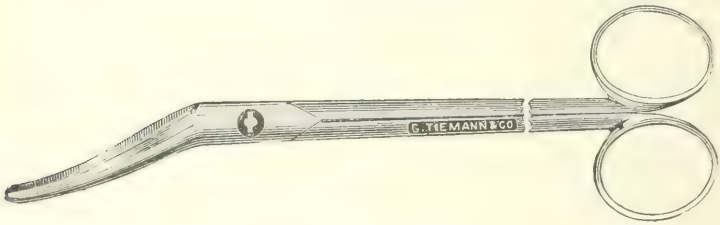


Emmet's Scissors for dividing the Cervix.

Fig. 143 shows a pair of blunt-pointed scissors, with straight blades bent laterally upon the shank at an angle of forty-five degrees. They are useful for dividing the cervix, for making an artificial vesico-vaginal or urethro-vaginal fistula, and for dividing cicatricial bands in the vagina.

The slightly- and strongly-curved scissors are almost indispensable

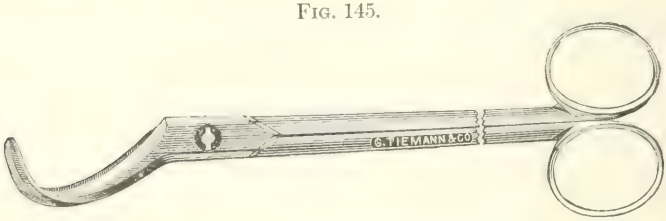
Fig. 144.



Emmet's Slightly-curved Scissors.

for denuding in plastic operations; the slightly-curved (Fig. 144) are used for perineal and for ordinary intravaginal denudation; the strongly-

Fig. 145.



Emmet's Strongly-curved Scissors.

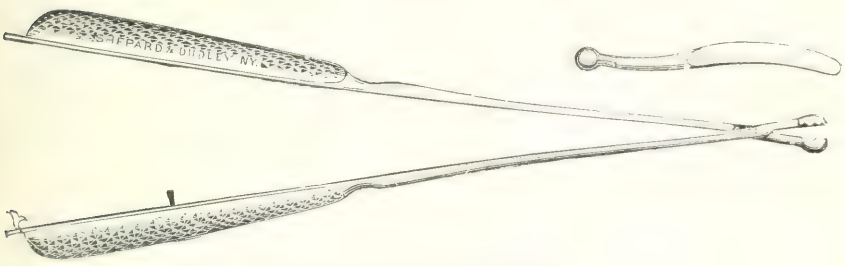
curved (Fig. 145) are convenient for denuding a strip high up across the vagina or cervix uteri in fistula and cervix operations. The scis-

sors represented in Figs. 144 and 145 are curved toward the right, and are intended to be used in the right hand. Emmet mentions also two others with curves to the left, but it is scarcely possible to imagine an operation in which the latter would be necessary.

Emmet's wire scissors, with blades pointed and slightly curved on the flat, are useful for cutting wire, and sometimes for cutting out cicatricial tissue. The slightly-curved scissors of Fig. 144 answer all the purposes for which straight scissors are usually employed.

Emmet's ball-and-socket knife (Fig. 146) has a blade which may be firmly attached at any angle to the shank by closing the handles, which

FIG. 146.



Emmet's Ball-and-Socket Knife.

are provided with a lock at the end. The knife may be used in places which are inaccessible to the scissors.

The Tenaculum.—Numerous tissue-forceps have been devised for grasping the tissues to be denuded or excised, but a properly-constructed tenaculum in the educated hand is the most convenient and effective instrument for this purpose. With the tenaculum the operator can

FIG. 147.

Uterine Tenaculum.

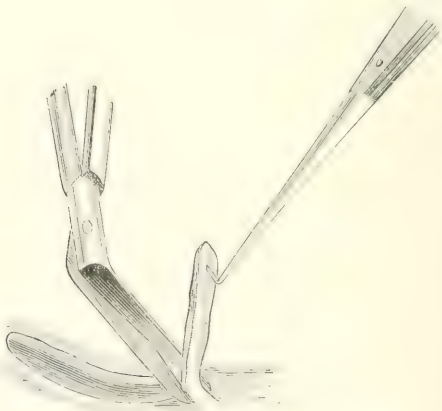
pick up and hold a smaller amount of tissue, and can therefore denude more superficially, than is possible with the tissue-forceps. The instrument (Fig. 147) has a perfectly straight hook a little more than a quarter of an inch long and at right angles to the shaft. It should be so strong and stiff that considerable force may be applied in the line of the instrument without breaking or bending the hook, or in a lateral direction without bending the shaft. The uterine tenaculum is useful not only in denudation, but also in almost every step of a gynecological examination or operation. In some operations as many as four of them may be required.

Plastic Operations.

The subject comprehends all operations for the repair of the puerperal lacerations and injuries, such as laceration of the cervix uteri and perineum and vesico-vaginal fistula. Union by first intention, which is an essential requirement of plastic surgery, will almost invariably result from a correct operation. In certain cases of vaginal fistula in which there has been great loss of tissue from sloughing, failures may arise from the cicatricial character of the parts or from difficulty in holding the edges together. Perineorrhaphy in very fat subjects, especially when the rupture extends through the sphincter ani muscle, may fail after the most skilful operation, but generally the conditions of success are within the control of the operator. These conditions are simple but absolute, and the operator who has neglected them cannot fairly attribute his failure to the debilitated state of the patient or to chance or to accident. Indeed, union must almost invariably follow if the surfaces to be united are properly prepared and kept in contact for a week. The first condition, antisepsis, has been discussed. The others will be presented in the following paragraphs.

Denudation.—The patient having been etherized, placed in position, and the field of operation exposed, the surfaces to be united should be denuded. Correct denudation is a prerequisite to healing

Fig. 148.



Denudation with the Tenaculum and Scissors.

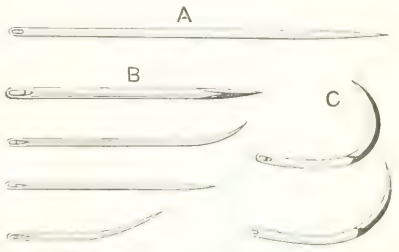
by first intention. Surfaces to be united should be so denuded that when brought together they will fit accurately, otherwise a part of the denuded surface, being in contact with an undenuded surface, must heal by granulation and suppuration, which may excessively irritate the rest of the wound, and would always produce cicatricial tissue, which is very

objectionable. The denuded surface should be smooth and free from shreds, which might die and become sources of septic infection. Every particle of membrane or skin within the area of denudation should be scrupulously removed. If the surface be perfectly healthy, the more superficial the denudation the better, but diseased and cicatricial tissues do not readily unite, and should therefore, when practicable, be removed.

Fig. 148 shows the action of the tenaculum and scissors in denuding. The superiority of the tenaculum as a substitute for the tissue-forceps must become apparent to any one who will familiarize himself with its use.

Needles.—A round needle is preferable to one with a cutting edge. The latter makes an incised wound which is generally too large for the suture, bleeds more freely, is prone to suppurate, and requires more time for healing. The former makes a punctured wound which readily shrinks down upon the suture, is less liable to bleed or to suppurate, and heals more quickly after the removal of the suture. Many of the most dexterous operators are partial to the straight needle in preference to the curved, especially when the long needle is used as in perineorrhaphy. The straight needle has two advantages: first, however deeply it may be buried in the tissues, the position of its point can always be determined from its direction and length; second, the force employed in its introduction being in the direction of the needle, it may without danger of breaking be of much smaller calibre than the curved needle, which must be introduced by a force exerted in the line of a tangent to the curve.

FIG. 149.

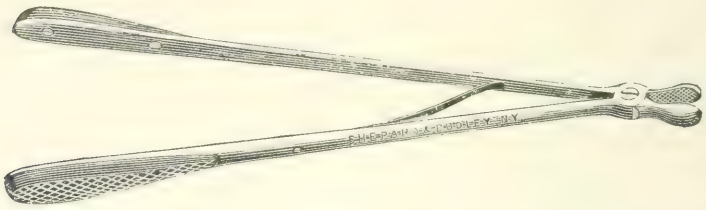


A, straight needle for external sutures in perineorrhaphy. *B*, straight and curved needles for operations on the vaginal walls and the cervix, and for vesico-vaginal fistulæ: the upper needle under *B* is trocar-pointed for very dense tissue. *C*, Simon's strongly curved needles for vesico-vaginal fistula.

The straight needle therefore requires less force for its introduction, is less liable to break, and makes a smaller wound. Moreover, the simple rotation of the needle forceps on its long axis by a turn of the wrist enables the operator to sweep the straight needle around a curve in the vertical plane, or it may be carried around a curve in the horizontal plane by loosening and tightening the forceps grasp upon the needle at very short intervals, so that the angle between the forceps and the needle may change almost constantly during its passage. In this way the straight needle may be made to carry a suture around a curve quite as accurately as the curved needle, and often more easily. Obviously, the lock forceps, which do not permit this freedom of motion, are unsuited

to such manipulations. Fig. 150 represents Emmet's needle-forceps without lock. The eye of the needle if included in the grasp of the forceps may be crushed; to avoid this, grasp it on the proximal side

Fig. 150.



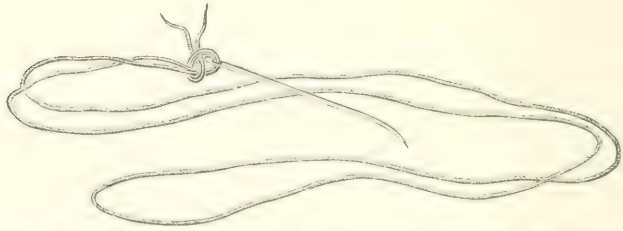
Emmet's Needle-Forceps. The spring between the handles causes them to open when the grasp is relaxed.

of the eye. The plain round point, however sharp, sometimes encounters great resistance in being passed through dense tissue. The trocar point represented in Fig. 149, *B*, or the saddler's point, is less objectionable than the cutting edge, and may be introduced almost as easily.

Various needles with handles attached or detached and of different curves and shapes have been devised, some with eyes at their points, some without eyes, and others of cylindrical form, through which the wire is passed lengthwise from one end to the other. They complicate rather than simplify an operation; they make punctured or incised wounds many times larger than the sutures which they are to contain; they are in no respect superior to the simple needle and thread.

The Application of Silver Sutures.—No. 26 silver wire, the proper size for gynecological operations, is too heavy to be threaded directly into the needle, but it may be easily drawn through upon a loop of silk, cotton, or linen thread secured to the eye of the needle by a half

Fig. 151.

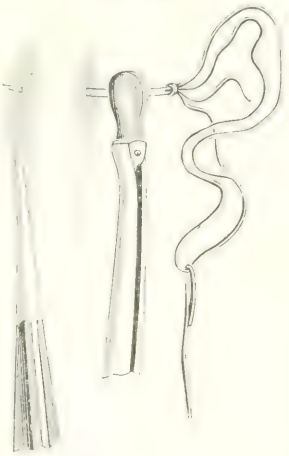


The Thread Loop, ten inches long, secured to the needle by a half knot for drawing through silver wire.

knot, as represented in Fig. 151. The knot should be drawn tight to prevent slipping, and the wire bent sharply over the loop, as shown in Fig. 152.

Before the introduction of the sutures, approximate the denuded surfaces with tenacula to determine whether they are of such size and shape that their union will produce the desired result, and whether accurate coaptation of their margins can be secured without undue traction, which might cause the sutures to cut out. Then hook up the margin of the wound with a tenaculum, introduce the needle, and when its point appears place the tenaculum under the point of the needle and apply counter-pressure, as in Fig. 152, until the needle can be seized and drawn through with the forceps. Some operators use the blunt hook (Fig. 153) for counter-pressure, but a strong tenaculum which will neither break nor bend is often preferable, because it may also be fixed in the tissues at the very point where the operator desires to force the needle through, and it thereby ensures greater precision in directing the needle to its point of exit. The use of the tenaculum also avoids multiplicity of instruments.

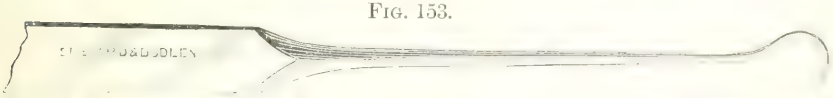
Fig. 152.



Showing counter-pressure and the attached wire, nine to twelve inches long, which is about to be drawn through by the thread loop.

Uterine tissue is often so dense that great force is required to drive

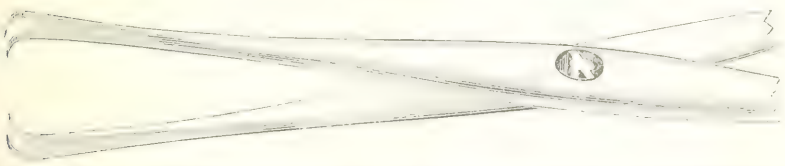
Fig. 153.



Emmet's Counter-pressure Hook, for making pressure beyond the point of the needle as it is passing through the tissues.

the needle through it. For this reason the passing of the needle is often the most trying part of trachelorrhaphy.

Fig. 154.



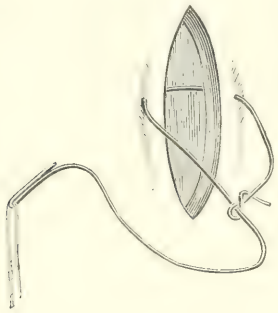
Vulsellum Forceps, with fine short teeth, to grasp the cervix in passing the needle for trachelorrhaphy. Between the two teeth of each blade is a deep opening to accommodate the passage of the needle. The instrument is provided with scissor-handles, and is about ten inches long (modified from Hanks).

In making counter-pressure the tenaculum may slip and the uterus receive a violent and sudden jerk, which is not without danger, espe-

cially when often repeated. This may be avoided and the operation facilitated by holding the flap in the vulsellum forceps (Fig. 154) while the needle is being forced through between its teeth. These forceps may be made by filing the teeth of Hanks's forceps shorter and finer, and by filing a deeper opening between the two teeth of each blade. The sutures should be about one-fourth of an inch apart—should include considerable tissue, and if possible to avoid it should not pass through the denuded surface or be in contact with any portion of the wound, because when at a distance from the denuded surface they are less liable to irritate and produce swelling or inflammation, and are therefore less liable to cut.

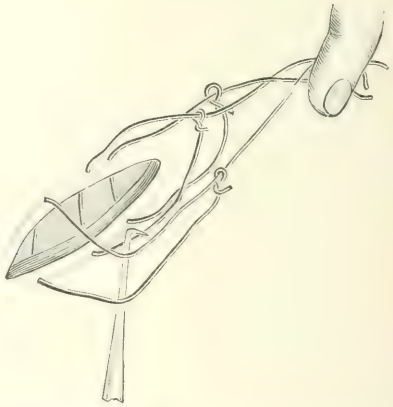
As each wire is drawn through on the thread and temporarily secured by a slipknot, as shown in Fig. 155, it is held out of the way by an assistant until all have been passed. Then, one after another, they are

FIG. 155.



Before twisting, showing a suture in position, with the slipknot.

FIG. 156.



Before twisting, all the sutures in position. One is being separated from the others by a tenaculum preparatory to twisting.

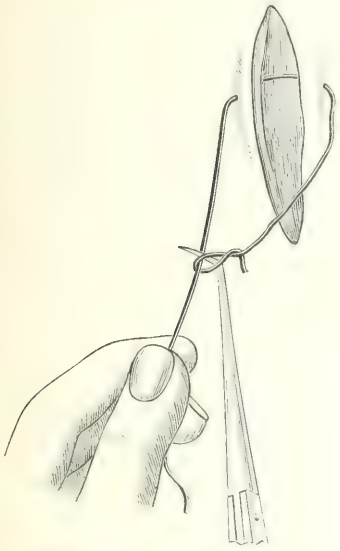
picked up, as in Fig. 156, and the traction is made upon the free end until the slipknot has been drawn down upon the tenaculum within an inch of the wound. (See Fig. 157.)

To prevent the ends of the suture from slipping out of the grasp of the twisting forceps, the wire is twisted for a short distance below the slipknot by rotating the handle of the tenaculum two or three times between the thumb and finger (Fig. 158). The twisting forceps are now applied over the slipknot, the loose wire cut off, and the suture shouldered by the tenaculum (Fig. 159).

When the twisting forceps have been applied and the suture has been shouldered (Fig. 159), the No. 26 wire will be found stiff enough to hold the margins of the wound in contact. The shield (Fig. 161) is

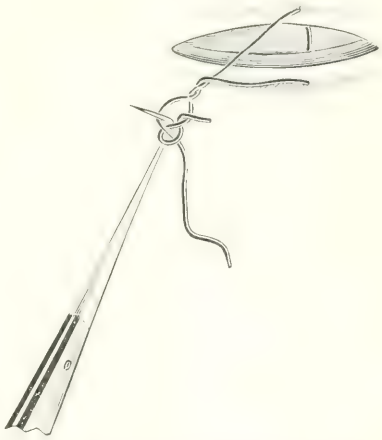
now applied, and the suture is twisted down to the shoulder (Fig. 162), but no farther, because, the margins of the wound being already in

Fig. 157.



The slipknot being drawn down on a tenaculum.

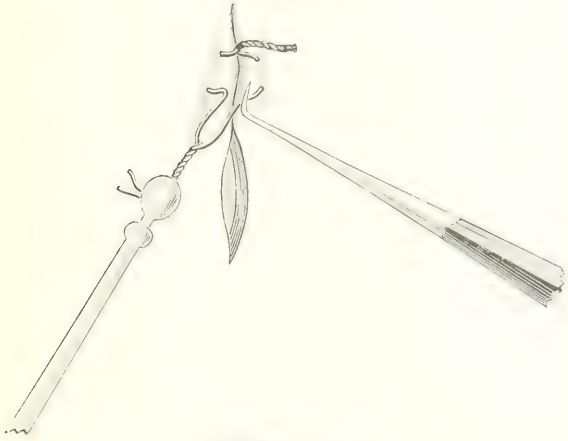
Fig. 158.



Twisting a suture with the tenaculum to prevent the wire from slipping out of the grasp of the twisting forceps.

contact, the wire if twisted beyond the shoulder would strangulate the tissues, and either cut through them or cause sloughing. If the wound

Fig. 159.

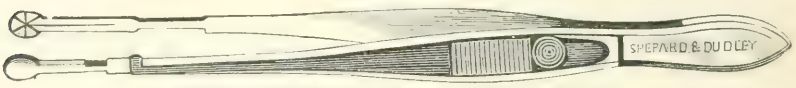


Shouldering a Suture.

cannot be brought together or nearly together by shouldering, it is evident that the traction upon the sutures, even though they be twisted

only to the shoulder, may cause them to cut or the flaps to slough, and the operation to fail. The object of shouldering, therefore, is twofold: first, to show that the flaps can be held together without undue traction; second, to limit the twisting and thereby prevent strangulation. The twisted portion of the suture should now be bent down upon the sur-

FIG. 160.



Emmet's Modification of Sims's Twisting Forceps.

FIG. 161.

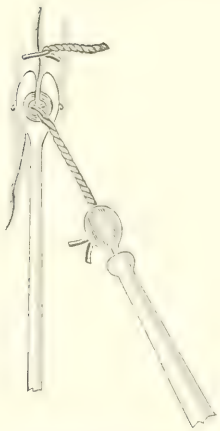
Sims's Shield.

face in the direction where it will cause the least irritation, and cut off about half an inch from the line of union. (See Fig. 163.)

Before twisting the sutures all bleeding points should be controlled by torsion or by fine catgut or fine silk ligatures, cut short. Catgut makes the best ligature for small vessels in the deeper portions of the wound, because of its ready absorbability.

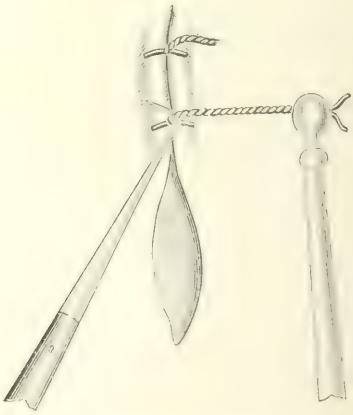
Thorough sponging or irrigation for the purpose of cleansing the

FIG. 162.



Twisting a Suture.

FIG. 163.



Bending the twisted portion of the suture down upon the vaginal surface.

wound during the twisting of the sutures is imperative. Any particle of coagulum or shred of tissue left in the wound will act as a foreign body, will decompose, and may prevent union. Just before twisting, two of the sponges on the sponge-holders may be trimmed to a small

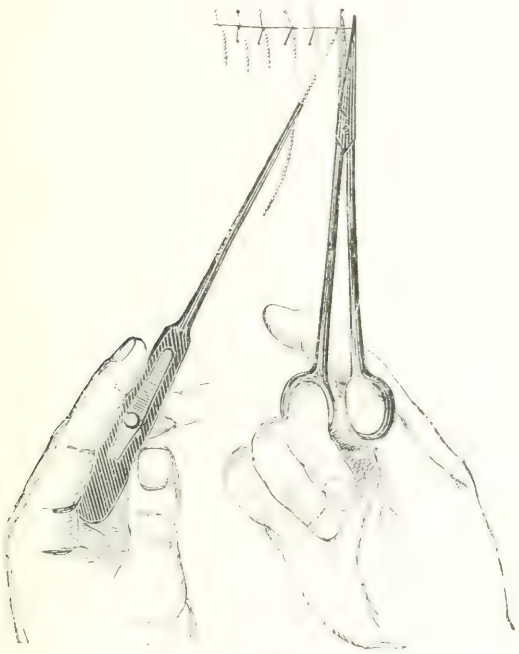
size and to a conical shape with the scissors, for use while the wound is being closed. The practice of operating under the constant hot antiseptic douche enables the operator to discard the sponge entirely and to secure perfect cleanliness. (See Antisepsis.)

The application of the silver suture to the vagina and cervix differs in some details from its application in perineorrhaphy, but for the technique of special operations the student is referred to the special subjects.

The after-treatment has been partially discussed under Antisepsis and other means to prevent pelvic inflammation. Further information may be found in those articles which relate to special operations.

Removal of Sutures.—Sutures about the vulva and perineum should be removed in about seven days. If left much longer they become

FIG. 164.



Removing a silver suture.

loose or cause suppuration. In the vaginal walls they may be left, if necessary, several days longer. In the cervix, where suppuration seldom occurs, they should be removed in ten to fourteen days, unless perineorrhaphy has been done at the same time, in which case their removal cannot safely be undertaken in less than three or four weeks. To remove a suture seize the twisted portion of the wire with a dressing-forceps, and with the wire scissors cut the nearest side of the loop. (See Fig. 164.) This tends to hold the freshly-united wound together

during the withdrawal of the wire. If the loop be cut on the farther side, its removal would tend to reopen the wound.

Dilatation of the Uterus.

It is impossible by means of any speculum yet devised to inspect the interior of the uterus, but its cavity may be made surgically accessible to the palpating fingers and to various instruments by dilatation. The principal objects of dilatation are to overcome stenosis or stricture of the uterine canal, to diagnose and remove causes of pathological uterine hemorrhage, such as granulations, polypi, and the remains of abortion, and to cure pathological flexions. The uterus may be dilated by incision, by tents, by graduated sounds, and by dilators with diverging blades constructed on the principle of the glove-stretcher.

Incision of any portion of the uterine canal may be required to render the endometrium accessible for instrumental or manual interference. But incision is specially applicable to the lower part of the cervical canal and to the external os, and is performed for congenital or acquired stenosis to ensure the free outflow not only of menstrual fluid, but also of the uterine mucus, which if retained becomes offensive, irritates the intra-uterine mucosa, and causes hypersecretion. Oftentimes the uterine secretions are so impeded in their passage through the strictured os externum that they accumulate, distend the uterine cavity, and are thrown off at irregular intervals with expulsive pains simulating labor-pains. This explains certain cases in which there is a recurrence in the intermenstrual period of all the painful phenomena of obstructive dysmenorrhœa. In such cases permanent cure succeeds the operation recommended by Fritsch[1] of Breslau, which is as follows: The patient being in Sims's lateral position, the vaginal portion is seized from the inner side of the os with a sharp tenaculum. An incision is then made one centimeter long in the direction opposite to the traction of the tenaculum; this is repeated on the opposite side and in front and behind. The four flaps thus formed are seized one after another with a tenaculum, and about half of each cut away. After this, retraction of the remaining portion of the flaps occurs and the external os remains funnel-shaped. The ordinary bilateral incisions show a decided tendency to reunite, and are therefore objectionable. The incisions may be made with the scissors (see Fig. 143) or with the knife (see Fig. 146).

Schroeder of Berlin[2] in certain cases, especially of intra-uterine polypi, incises the cervix bilaterally, seizes the posterior lip with a vulsellum forceps, and with his finger as a dilator works his way to the uterine cavity. The uterus dilated in this way and well drawn

[1] *Diseases of Women*, Am. ed.

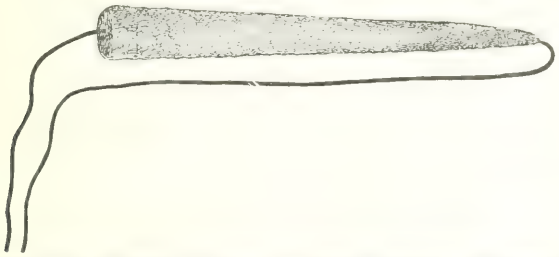
[2] *American Journal of Obstetrics.*

down is very accessible. In Schroeder's method the lateral incisions extend into the dangerous neighborhood of the parametria. The safety of the operation must therefore depend upon thorough antisepsis. It is impracticable in a rigid uterus to incise and dilate according to Schroeder's method.

TENTS.—Sponge, sea-tangle, and tupelo are the materials commonly used. If introduced into the uterus in the dry compressed state, the mucous secretion, stimulated by their presence, causes them to swell laterally to a diameter two or three times greater, and correspondingly to dilate the canal.

Sponge tents, which have a dilating power of about three times their diameter, are made of disinfected compressed sponge, straight or curved to fit the uterine canal, and perforated from end to end to admit a strong

FIG. 165.



A Sponge Tent with thread passing through it. Before introduction the ends of the thread should be tied together.[1]

thread (see Fig. 165), by means of which the tent may be held together during removal. Otherwise a fragment may be left behind and be an unsuspected source of dangerous infection.

The sponge tent not only expands, but at the same time softens the walls of the uterus, and thereby prepares them for further dilatation and renders the cavity more accessible for surgical manipulation; in this respect it is more effective than tupelo or laminaria, and much more effective than steel dilators, which usually leave the uterus so elastic that immediately after their removal the introduction of the finger or of an instrument for diagnostic or surgical purposes may be impossible without further dilatation. But the softening effect is the result of excessive irritation, congestion, and secretion due to the presence of the sponge. Under such conditions it may, in an incredibly short time, become offensive and dangerously septic from decomposition of the absorbed secretions. It often also becomes so adherent and incorporated with the intra-uterine membrane that portions of the epithelial layer may be stripped off with its removal. The surfaces thus exposed would furnish a ready avenue for the absorption of the secretions. Dis-

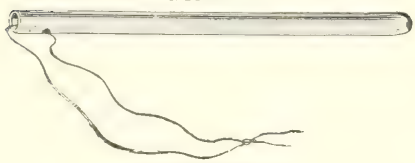
[1] *Thomas on the Diseases of Women*, p. 103, 6th ed.

astrous results seldom follow the application of a single sponge tent unless the patient has suffered from a previous cellulitis or peritonitis, but the danger increases rapidly with the introduction of the second and third. Many operators now discard them altogether.

Tupelo tents, made from the tupelo tree (*Nyssa aquatica*), expand less powerfully but more rapidly than sponge to about double their compressed size, and, inasmuch as they do not so readily become offensive from decomposition of the absorbed secretions, they are less dangerous. They are straight and inflexible, and therefore not easily introduced in cases of acute flexion, especially when there is immobility at the angle of flexure. They are, however, very smooth, and slip into place when the canal is straight or nearly straight more easily than sponge. If the tent selected is found on trial to be too large, it need not be thrown away, but may be easily cut down to the required size with the penknife. A standard author has included among the many advantages of the tupelo tent the possibility of recompressing it for repeated use, but for obvious reasons such a practice can be neither safe nor permissible.

Laminaria tents, also called sea-tangle tents, have more expanding power than tupelo and less than sponge, but their action is so slow that they are liable to be expelled from the uterus before they have become sufficiently extended to be self-retaining. They have but one advantage over tupelo, which is their flexibility. After soaking in warm water for a few minutes they may be bent to any desired curve, and may therefore be introduced in cases of uterine flexure. Fig. 166 represents a laminaria tent perforated from end to end to make it dilate more rapidly, according to the recommendation of Dr. Greenhalgh of London. Expansion of laminaria is very slow, requiring thirty-six hours for the maximum dilatation.

FIG. 166.



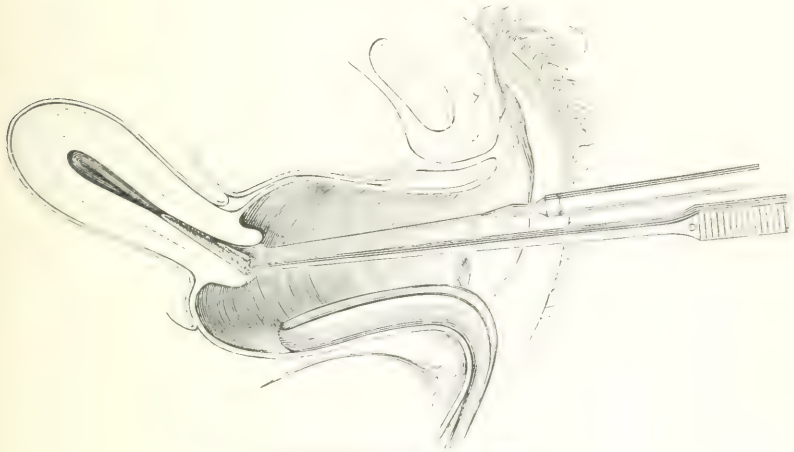
A Sea-tangle Tent.

INTRODUCTION AND REMOVAL OF TENTS.—Unless the uterus be so low that the os externum is near to the vulva, a speculum will be required for the introduction of a tent. Sims's speculum is most suitable, and indeed indispensable in difficult cases, especially when the uterus is much anteflexed or anteverted. Before introducing the tent the vagina and vulva should be thoroughly cleansed, the cervix exposed by the speculum, and the direction and curve of the uterine canal ascertained by the probe; then a tent of corresponding curve should be seized in the forceps and introduced while the cervix is fixed with a tenaculum, as shown in Fig. 167. A small tampon of antiseptic cotton should then be placed against the cervix to hold the tent in place.

The time required for a sponge or tupelo to reach its maximum dilatation is from six to twelve hours. Several small tents may be introduced at one time instead of a single large one.

The tent may sometimes be removed by traction on the attached thread, but when considerable force is required it is better to use the

FIG. 167.



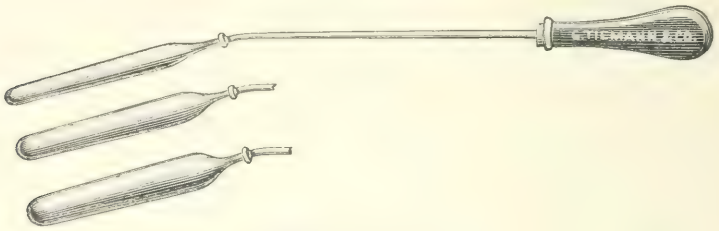
Introduction of a Tent (Sims's).

speculum and forceps, and in making traction to use counter-pressure against the cervix, which may be steadied by placing two fingers against it, or by fixing it with the vulsellum forceps, or by encircling it with the fenestrated end of a Sims's depressor. After the removal of the tent some blood usually flows from the intra-uterine surface, which is usually more or less abraded, especially if a sponge tent has been used, and the endometrium should therefore be thoroughly washed out with an antiseptic solution, to be followed with an application of Churchill's tincture of iodine over the entire uterine cavity. In cases requiring further dilatation the iodine should be omitted until the last tent has been removed. The danger of continuous dilatation by introducing one tent after another is very great. As already stated, the alarming results have generally followed the use of the second or the third tent, seldom the first. A tent should not be allowed to remain in the uterus more than twenty-four hours under any circumstances, and generally not more than twelve.

GRADUATED SOUNDS.—The uterus, like the urethra, may be dilated by means of graduated sounds. Fig. 168 shows Fritsch's uterine dilators. Peaslee, Hegar, and Hanks have devised similar instruments which are equally serviceable. They are particularly adapted to cases in which the abdominal walls are thin and lax, so that the uterus may be easily fixed by the hand over the abdomen, while one sound after

another is forced into the canal until the required dilatation is accomplished. If the abdominal walls are thick and tense, it is necessary to place the patient in the latero-prone position, to use Sims's speculum,

Fig. 168.

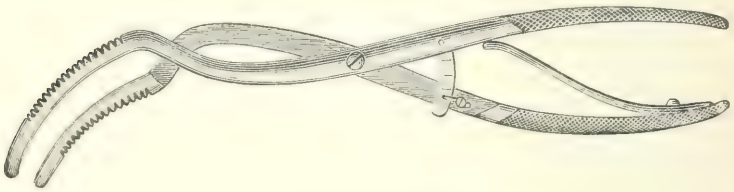


Fritsch's Uterine Dilators.

and during dilatation to fix the cervix with the vulsellum forceps. In such cases the diverging instruments are preferable.

Diverging Instruments.—Innumerable instruments have been

Fig. 169.

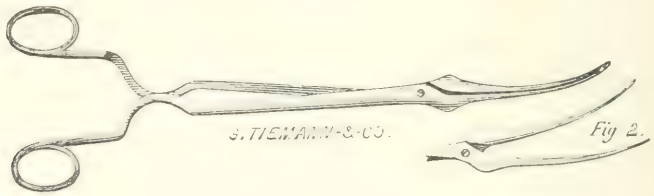


Schultze's Dilator.

devised with blades which diverge and dilate the uterus when the handles are pressed or screwed together. (See Fig. 169.)

Schultze's dilator and Goodell's modification of Ellinger's dilator[1] have serrated blades to prevent them from slipping out during the pro-

Fig. 170.



Nott's Uterine Dilator.

cess of dilatation: this accident is much more liable to occur with the latter instrument, on account of the parallel action of its blades, and notwithstanding strong counter-traction with the vulsellum forceps it does occur in many cases long before dilatation can be completed. The blades of the Schultze's dilator diverge in a fan-like manner, and are

[1] See p. 319 in "Gynecological Diagnosis."

therefore a little more liable to injure the uterus, but they do not slip out, and are therefore to be reserved for cases in which the Ellinger instrument cannot be retained. These dilators are generally too heavy to be inserted until the way has been opened by a lighter instrument, like Nott's (see Fig. 170), or by the smaller graduated sounds (Fig. 168), or by a tent.

Dr. Goodell[1] of Philadelphia has been foremost among the advocates of this method of dilatation. In a large experience with extreme dilatation under ether he has had no fatal result and no serious inflammatory disturbance. He carries the dilatation to three-fourths of an inch in the thin-walled, unyielding infantile uterus, and to one and a fourth inches in other instances. In case of a rigid, unyielding, or thin-walled uterus, which might tear from rapid expansion of the dilating blades, it is better to commence dilatation with a sponge or tupelo tent, the softening influence of which renders the canal more easily and thoroughly dilatable by the forcible method.

The dangers are traumatic and septic, the former even to the extent of rupture of the uterus and consequent peritonitis, and death may result from over-distension by rapid dilatation of a rigid uterus. The latter danger is preventible by antiseptics. The special dangers of dilatation by tents, and the impossibility of enforcing thorough antisepsis in their use, have been considered in a previous paragraph. It would, however, be a fatal mistake to suppose that antisepsis deprives dilatation by any method of all its perils. All manipulations of this class, says Fritsch, are dangerous, and not to be employed unless the indication is quite clear. Existing pelvic inflammation, acute or chronic, is a serious contraindication. Indeed, the history of a majority of fatal cases includes previous cellulitis, peritonitis, or metritis. Dilatation, however slight, by any method, should be regarded as a surgical operation, should always be done at the patient's house, never at the office, and should be followed by rest in bed for a time varying from one to seven days. Forcible dilatation either by sounds or by diverging instruments requires an anæsthetic, except when the dilatation is to be slight. If there be tenderness about the uterus or other signs of inflammation, or if the patient has suffered from a previous attack, ice should be kept over the hypogastrium, quinine should be given in full doses, and opium according to the pain until the danger has passed.

The special advantages of each method of dilatation may be summarized as follows:

Incision.—Contraction of the os externum and lower portion of the uterine canal is best treated, according to the nature of the case, either by Fritsch's operation for enlarging the os externum by incision or by Schroeder's operation of bilateral incision of the cervix.

[1] *American Journal of Obstetrics*, 1884, p. 1179.

Tents.—Sponge tents are the most dangerous, tupelo least. Laminaria has but one advantage over tupelo, its flexibility and adaptability to a tortuous canal. In a case of rigid hyperplastic or thin-walled cervix not safely dilatable by rapid means the tent is specially indicated as a means of preparation for rapid dilatation by graduated sounds or diverging instruments.

Graduated Sounds and Diverging Dilators are generally the safest and most effective means of dilatation, and should have the preference unless the softening effect of the tent is specially desired.

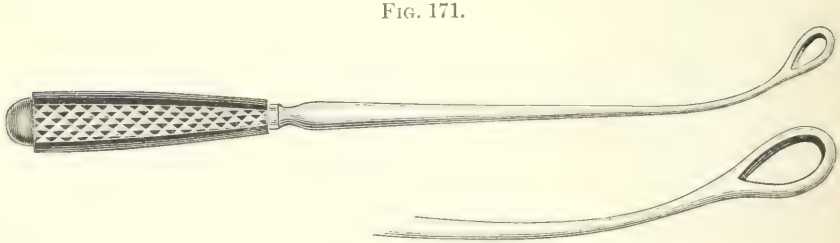
The Curette.

The curette is a spoon-shaped instrument, fenestrated or non-fenestrated, with a dull or sharp cutting edge, which may be introduced into the uterus, with or without previous dilatation, for the purpose of scraping away diseased tissue for diagnostic or remedial purposes. The instrument, first introduced in 1843 by Récamier, has passed through many modifications and received the severest censure, not wholly undeserved, on account of its disastrous results, among which are perforation of the uterus, cellulitis, peritonitis, metritis, and septicæmia.

The indications for the curette are hemorrhage and septicæmia, due to the presence of some intra-uterine cause.

The dull wire curette of Thomas (see Fig. 171) fulfils nearly all the

Fig. 171.



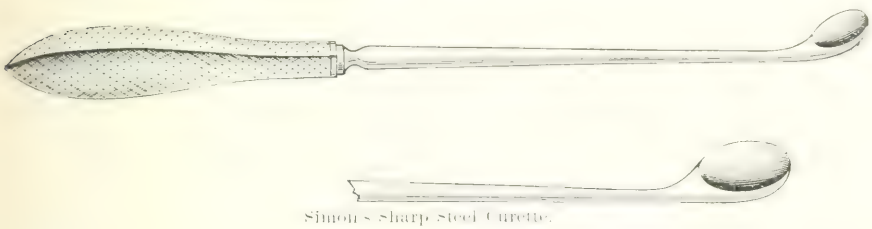
Thomas's Dull Wire Curette.

indications of the instrument, and in suitable cases its use is almost entirely free from danger. It is made of flexible copper wire. The loop at its extremity has slightly flattened but not cutting edges. Its shank may be bent like a probe to conform to the direction of the uterine canal, and whatever the force applied it is not likely to injure the sound tissue, while it easily removes the soft, friable products of hyperplastic endometritis called granulations, or the secundines of an abortion, or soft tumors malignant and benign.

Simon's steel curette (Fig. 172), not fenestrated, or Sims's fenestrated, each of which is provided with a sharp cutting edge, should be reserved for the removal of diseased mucous membrane or of malignant tumors

which resist the dull instrument. Curettes of various sizes are required according to the amount to be removed and the size of the uterine cavity. The smaller sizes may be introduced and used without previous dilatation. During the operation, which is best performed through

FIG. 172.



Simon's Sharp Steel Curette.

Sims's speculum, the cervix is held by a uterine tenaculum. After all the diseased tissue has been removed the endometrium should be wiped out with absorbent cotton, and then with cotton saturated with Churchill's tincture of iodine. The dangers, contraindications, and precautions are the same as in dilatation of the uterus.

THE VAGINAL TAMPON.

The tampon should fulfil the double object of preventing hemorrhage and of producing such pressure against the upper portion of the vagina as to impede the flow of blood to the uterus. In cases of extreme hemorrhage it often becomes necessary, before placing the tampon, to plug the cervical canal with cotton saturated with tincture of iodine or some other astringent. This cervical tampon should be composed of a single piece of cotton, so that it may be easily removed. The material of the tampon should be cotton made into pledgets about two inches square and half an inch thick, and saturated with a solution of alum and squeezed dry. Its application through Sims's speculum, which for this purpose is almost indispensable, has been well described by Emmet. The following is the substance of his directions: Empty the bladder, place the patient in Sims's position, and introduce the speculum. Remove all clots, smear the vagina thoroughly with vaseline or lard, which renders the canal more distensible and the packing less painful, and tends to retard the flow of blood between the tampon and the vaginal walls; then place a pledget of cotton, freshly dampened with a solution of alum, over the cervix; then roll up a mass and place it in the posterior cul-de-sac, also on each side and in front; cover all this with a flat piece of cotton; then place pledgets around the cervix in a circle, and fill in the centre; press back the cotton from the circumference to the centre with a stout whalebone or wooden stick in the left hand and a pair of dressing-forceps in the right, and as room is

thus gained fill in with more cotton. When the vagina has been well filled press it firmly back with the stick from the anterior wall toward the hollow of the sacrum, and slip the speculum in front of the mass. As the speculum is drawn back by the assistant the space left will extend nearly to the uterus. This is to be filled in the same manner, and the speculum repeatedly withdrawn and replaced in front of the mass, and the remaining space again filled, until the whole canal is firmly packed. No violence should be used, but by going around and around the mass and firmly packing in with the stick and the forceps one small portion after another, the pelvic basin may be almost entirely filled. If the tampon be large, confine the patient in bed and give an anodyne. Should the anodyne fail to give relief, the lower portion of the cotton may be removed. If there be retention of urine, it should be drawn with an elastic male catheter. The tampon should not be left longer than twenty-four hours. Before applying another it is best to wash out the vagina with an antiseptic douche and to relieve the bowels by an enema.

Dr. Frank P. Foster[1] of New York recommends lampwick as an excellent material for the tampon, on account of the ease of its introduction and removal even without a speculum, and on account of its ready absorbability. He says: "When the tampon is to be removed the patient simply makes traction upon the portion of wicking that was left hanging from the vulva, and the mass within the vagina is unwound as the traction proceeds; consequently, no large wad has to pass the vaginal orifice and the extraction of the tampon is painless. Besides the advantage of its greater absorbent property, I find that wicking is better adapted to the easy and rapid performance of such a proceeding as I have described than any of the other substances mentioned, including the roller bandage. Moreover, it is sometimes desirable to tampon the cervical canal, or to introduce a medicinal agent into the uterine canal in such manner as to ensure its prolonged contact with the endometrium. For such purpose an inch or more of the end of the wicking may be stiffened with gelatin, and then, after having been dipped into the liquid to be applied, be introduced into the canal by means of a pair of dressing-forceps. If care is taken not to coat the whole circumference of the wicking with the gelatin, the liquid medicament readily permeates the stiffened wicking, and a considerable quantity of it may thus be introduced within the uterine canal. Enough more wicking is then inserted into the vagina to act as a tampon, and when this is removed the portion originally introduced into the uterus comes out with it."

[1] *New York Medical Journal*, June, 1880.

GENERAL THERAPEUTICS.

By ALEXANDER J. C. SKENE, M.D.,
Brooklyn, N. Y.

A rational system of therapeutics is based upon a knowledge of the various morbid states, a clear comprehension of the nature and action of the agents employed in the treatment of disease, and a judicious adaptation of the latter to the relief of the former.

It is presumed that the readers of this work are familiar with diseases in general and the means to be used in their treatment. My task, therefore, is limited to a general consideration of the selection and administration of the most reliable means to be employed in the management of the diseases which come under the care of the gynecologist.

The order in which I intend to discuss the several branches of this subject is to consider very briefly some of the chief points in the management of functional derangements, and then the general and local treatment of the organic diseases of the uterus chiefly.

The derangements of menstruation, classified according to their causes, are malnutrition, morbid innervation, and organic diseases of the nutritive system which give rise to conservative amenorrhœa. Reference may be made also to derangements or absence of the menses due to malformations and diseases of the sexual organs.

In the treatment of all the derangements of the menstruation the one cardinal point must ever be kept in mind—viz. to remove the cause, be it local or general, upon which the derangement of the uterine function depends.

Amenorrhœa and scanty menstruation, so frequently due to anæmia, promptly yield to restorative tonics and proper food. This is one of the best-established facts in therapeutics. Iron is of course the restorative tonic most to be depended upon in the management of anæmia. However, there are some ideas regarding the use of the different preparations and the combinations of iron with other remedies which must be mentioned in this connection.

The muriated tincture of iron is one of the oldest and most reliable of all preparations, and answers in the great majority of cases. It may

be confidently used at all times, except when there is some objection made on the part of the patient or when anæmia is associated with some other disorder which demands attention. Sometimes the remedy disagrees with the patient or she fancies she cannot take it; then some other preparation may be used.

The fastidious will take the tartrate of potassa and iron in wine, and sometimes profit by it, while others will take iron in pill form with great advantage. When the anæmia is accompanied with other morbid states, remedies may be combined with iron to remove these complications. In subjects whose breathing capacity is limited the action of iron will be aided by combining with it chlorate of potassa, which is said to aid in the aëration of the blood. Again, in torpor of the liver muriate of ammonia acts well; hence a good combination for such subjects is the tincture of iron, chlorate of potassa, and the muriate of ammonia.

When there is exhaustion as well as impaired nutrition of the nervous system nerve-tonics should be added to the iron. Strychnia is a favorite remedy, and many of the ready-made tonics of the present time have for their chief ingredients iron and strychnia. This remedy, however, is not a restorative tonic in the true sense of the term. At best it can only arouse the nerve-energies for a time, and hence its use should never be long continued, neither should the doses given in amenorrhœa be large.

There are other nerve-tonics better adapted to the depressed state of the nervous system accompanying the menstrual disorders. The phosphates have long had a reputation in the list of the nerve-tonics, and they should be combined with iron whenever called for. The pyrophosphate of iron was at one time popular, and deservedly so. Among the various preparations of the phosphates, Parrish's compound syrup of phosphates is quite equal, if not greatly superior, to many of the fashionable compounds of the present day. Phosphorus is of course the thing required, but it is difficult to administer. A solution of phosphorus in cod-liver oil, put up in pills, is one of the best ways of giving it, but the odor and taste are so disagreeable that many patients cannot or will not take it.

Some of the cerebro-spinal stimulants act well in the menstrual disorders due to depressed and exhausted states of the nervous system. Belladonna, cannabis indica, and all of this class, when given in doses sufficient to stimulate the nervous system, sometimes appear to act favorably in amenorrhœa and scanty menstruation. In their action they appear to sustain the nervous system when given in small and continued doses. In regard to belladonna, hyoscyamus, and all of that class, they should be given in small doses—very much smaller than recommended in the textbooks. These stimulants act best in those

cases of depression from exhaustion from over-fatigue when associated with imperfect menstruation.

There is a large class of menstrual derangements due to deranged innervation in the form of undue excitement, and not necessarily accompanied with anæmia. A strong impression made upon the nervous system from any cause sufficient to produce shock will arrest the menstrual functions in many cases. So also over-mental excitation from any cause will, if long continued, have the same effect. In all this class of cases nerve-sedatives are indicated—remedies that will give the required sedation without the objectionable effects of such agents as opium and chloral hydrate. These should be in such cases avoided, because this class of patients acquire the habit of taking such nerve-sedatives with extraordinary facility.

The bromides take the highest rank in the management of these cases. In acute cases the bromide of sodium should be given in full doses until all the nervous perturbation is overcome, and when this is accomplished it frequently happens that the menstrual function will be established without further treatment. The use of this remedy should be limited to acute derangement of innervation in women otherwise in good health. Whenever there is general weakness from impaired nutrition the bromides should not be given in large doses nor long continued: enough to procure quiet sleep (if it is possible to do so with bromide) and relieve the nervous excitement is all that is required of this remedy. In such conditions the bromides will often fail and other remedies must be resorted to. A favorite combination of mine is the extracts of valerian, conium, and lupuline with camphor, given in a capsule. This often answers the purpose of a nerve-sedative, giving sleep and a disposition to rest, which affords the patient time and inclination to menstruate. Valerianate of zinc, valerianate of ammonia, monobromide of camphor, bromide of zinc, and like remedies are all of some service in such cases, and should be resorted to when the other means have failed.

The permanganate of potash has recently been introduced by Sydney Ringer of London as an excitant of the menstrual function. I have used this remedy in a number of cases of amenorrhœa, and have derived benefit from it; but I have not had the extraordinary results from it that would enable me to speak in such strong praise of it as many have done. At first I gave it in pill form, and that may have been against its success. But when I gave it in solution it did not always satisfy me. One trouble is to get it into the circulation, it is such an easily decomposed stuff. I have seen recently that oleate of manganese is commended by Dr. Franklin H. Martin in the *Medical Record* for June 27, 1885. The binoxide of manganese has also been used in its place with alleged good results.

The rule is that when all the conditions necessary to menstruation are restored the flow will return. Still, there are cases of amenorrhœa which occur with or without apparent cause, and persist long after the appreciable defects in general health have been overcome. In such cases we seek for remedies that will act directly upon the sexual organs to re-establish their function if entirely absent, or to increase the flow if it is deficient in quantity. The agents generally used for this purpose are sabina, aloes, caulophyllum, myrrha, cimicifuga, tanacetum, cantharides, and guaiac. The action of these remedies is to produce stimulation and irritation of the mucous membrane of the alimentary canal, and it may be presumed that a similar effect, though in a less degree, is produced upon the uterus.

The congestion of the pelvic organs caused by these drugs may act as an exciting cause of menstruation if they are given at a time when there is a predisposition to menstruate and the local and general conditions necessary to menstruation have been established. They are certainly worse than useless when given in cases of amenorrhœa due to any constitutional or local affection, such as anæmia, deranged innervation, and disease of the uterus or ovaries.

There is also great difficulty in estimating the value of the so-called emmenagogues, because of the fact that the menstrual function will recur in the great majority of cases when the causes of the amenorrhœa have been removed. Therefore, when emmenagogues are given and the menstrual flow is established, it is not sufficient proof that the medicines used have produced the results observed. Again, I have observed that in cases of amenorrhœa in which no cause could be discovered the so-called emmenagogues have failed to restore the menses. They are agents which are capable of doing harm by deranging the digestive organs, and hence I very seldom use them; and from all that I can learn of the practice of others, they are not so frequently resorted to as formerly, and there is reason to believe that they will soon fall out of use entirely.

There are other agents which have been used to promote the menstrual flow in cases where the amenorrhœa has remained after the general condition of the patient has been restored to health and the flow has not returned. Of these agents it may be said that they are not likely to do harm, and their recognized general therapeutical action suggests at least the possibility of their being useful. These are the diffusible stimulants, like alcohol, ammonia, camphor, chloric ether, and acetate of ammonia.

There are two conditions in which these remedies are indicated. The first is where the subject has been exposed to cold at the time when the menstrual flow should appear, but does not. We counteract the effects of the cold and equalize the circulation by means of a warm bath, and

then ammonia with camphor, a small dose of warm gin or whiskey punch, or the acetate of ammonia will often give good results. To the other class belong those who have symptoms of a tendency to menstruate—*i. e.* have a menstrual molimen, but the flow does not appear. In such cases the remedies referred to may be employed with advantage. In those of full habit alcohol should be avoided. In such cases the ammonia and camphor will act best.

In all countries where malarial poison prevails deranged menstruation is frequently experienced: the effect of this miasm upon the function of the uterus is manifest in many ways. The anæmia which so frequently occurs in malarial poisoning produces amenorrhœa. The effect of the poison on the nervous system gives a like result. Chronic malarial poisoning, with morbid changes in the abdominal viscera, influences menstruation in a marked degree. Amenorrhœa is observed in these subjects occasionally, but menorrhagia is perhaps more common.

In all cases arising from this common cause quinine and arsenic are the agents to depend upon. In cases of long standing with engorgement of the abdominal viscera and enlargement of the spleen and liver an occasional dose of mercury aids greatly in the treatment. Finally, when all the causes have been removed and the menstrual function is not established, and the means usually employed to restore it have failed, electricity is well worthy of a trial. The interrupted current is said to be the most valuable form of the electric treatment.

General or central faradization may be tried, and if this fails the current should be passed through the pelvis, one electrode being placed over the sacrum and the other over the pubes. The best way of all is to pass one electrode into the uterus and the other over the sacrum and pubes alternately. But this method is seldom practicable in the unmarried.

New impressions from change of surroundings are often of great value in obstinate cases. Change of air gives increased vigor to the nutritive functions, and new subjects of interest and new associations are marked stimulants to the brain and nervous system; all of which favor the highest functional activity of the uterus.

The Constitutional and Local Treatment of Organic Diseases of the Sexual Organs, especially the Uterus.—On this subject there is possibly less harmony of opinion and practice among gynecologists than there is in regard to the foregoing subject. Yet all know very well that local diseases, organic as well as functional, are largely under the control of constitutional medication.

The sexual organs being dependent upon the general nutritive system for support and the general nervous system for innervation, it follows that through this relationship they are dependent in health and disease, and that any marked defect in the general health must act to the injury

of the sexual organs. It is also clearly apparent that to affect the sexual organs with therapeutic agents we must often take the nutritive and nervous systems as the channels through which to reach them.

There are a vast number of ways by which the general organization works to the detriment of the sexual organs, and in the practice of gynecology the general health must at all times be looked after, both in connection with the causation and treatment of uterine and ovarian diseases. It is also well to keep in mind that constitutional remedies reach and act upon the sexual organs through both the nutritive and nervous systems. Owing to this correlationship of the general organization and the sexual system the remedies employed by the gynecologist may be classified as follows: First, remedies which act indirectly upon the sexual organs by modifying the general nutrition; second, remedies which act through the nervous system; third, remedies which act especially upon the sexual organs, either through the circulation or nervous system; fourth, agents used locally which influence morbid states of the sexual organs.

Under the first head may be classed all agents which are capable of improving general nutrition. This embraces a field altogether beyond the scope of this work, and hence I must limit my labors to the consideration of the derangements of nutrition most commonly seen in connection with diseases of the sexual organs, and more especially to those functional disturbances of the nervous system and digestive organs caused by, or at least aggravated by, uterine and ovarian diseases. Prominent among these will be found impaired appetite and constipation. The loss of desire for food or a capricious appetite may be wholly due to derangement of the nervous system, the stomach itself being free from organic disease.

If this functional disturbance exists long, gastric catarrh is likely to come in due time. The former may usually be distinguished by the fact that the appetite is capricious, at times good and at other times poor. The tongue is not always coated, but more often light red and the papillæ prominent. In the latter (catarrh) there is usually a constant loathing or dislike for food, and the tongue has the swollen and coated appearance characteristic of that disease.

In the management of either form of the gastric disorder the quantity and character of food are of primary importance. Full details of the dietetics of this class of cases must be obtained from works on the practice of medicine. A word or two may, however, be admissible.

As a rule, the likes and dislikes of the patient regarding food should be respected, unless in cases where the nervous system is markedly perverted and the fact is manifested by unreasonable capriciousness. In order to get a beginning to improve great advantage may be obtained by using the digested foods. Peptonized milk, gruel, and beef should

be tried. Lately I have been able to nourish some of the most obstinate cases with the preparation known as "Fairchild's humanized milk." This is intended for infants, but it has proved of great service in beginning the treatment of many cases of feeble indigestion.

Forced feeding has been greatly in vogue of late, and it has its advantages. The method is to begin by giving small doses of food at short intervals, and increase the quantity regularly until the capacity of taking an abundance is developed. The system is an admirable one, and is especially suited to the cases of gastric neurosis and reflex gastric disorders. It has its limits, however, as there are cases where it seems to be unsatisfactory. As soon as the patient has improved sufficiently in the power of digestion a liberal and varied quantity of food should be given.

The medicinal agents to be employed to aid digestion and create an appetite are of two classes—sedative and tonic. Gastric sedatives will quiet irritation and improve the appetite in certain cases. Of these, bismuth, oxalate of cerium, and hydrocyanic acid are the most reliable. The oxalate of cerium should be given in larger doses than the books direct. Five or six grains before meals are a sufficient dose. These remedies should be given half an hour before meals.

The tonics are the vegetable bitters, the preferable ones being columbo, quassia, and cedron. The drachm doses of these bitter tinctures generally given do not act well in the cases under consideration. Such doses contain too much alcohol for irritable stomachs unless largely diluted, and then the quantity is too great. Half a drachm, or even less, in a little warm water is more efficient and acceptable. Two or three drops of nux vomica in a small wineglass of warm water acts well with many. Two drops of wine of ipecac. added to the nux vomica makes a most valuable combination. Four drops of fluid extract of cedron given in water is also of great value in giving an appetite. The bitter is clear, well defined, and passes away very soon, leaving an agreeable taste in the mouth.

Much may be done by a competent nurse who understands how to offer tempting articles of diet.

When food is being taken in fair quantities only half the battle is won in many cases. The digestion may be labored and attended with much distress—in some cases immediately after eating, in others an hour or two after. Much of this may be avoided by giving food that is easily digested. If this fails, the digested foods already referred to should be given. Pepsin helps this labored digestion in certain cases, while in others it is useless. When pepsin alone fails, I have combined with it lactic acid and some aromatic, like tincture of cardamom. This is given after the meal in hot water.

The disagreeable behavior of the stomach is often greatly aggravated

by the state of the bowels. Indeed, many times I observe that when the bowels are made to act properly the stomach, which has been out of order, takes up its duties at once.

Constipation of the bowels is an almost ever-present state in those who have disease of the sexual organs. This is caused either by deranged secretion of the alimentary canal, impaired muscular action, deranged innervation, or all three together. The condition of the tongue and the character of the discharges will show imperfect secretion, and this can best be relieved by beginning with a dose or two of mercury. A dose of blue mass with a grain of ipecac. at night, followed if need be by some gentle laxative, will often give good results. For those who alternate between constipation and diarrhœa a favorite prescription is blue mass, calcined magnesia, aromatic syrup of rhubarb, glycerin, and peppermint-water.

To keep the bowels in order after one or more doses of these alterative cathartics the mineral waters, natural or artificial, will answer well for those whose secretions are retarded. In the use of these there are two rules which ought to be observed: First, to give the water at least one hour before meal-time, the morning being preferable if the patient can take it then; and second, to select by trial the water which suits the case in hand. Practitioners are apt to use some favorite water for all cases, while the rational method is to select from the many the one which gives the desired results in severe cases.

When the constipation is due to muscular and nervous debility, mineral waters and saline laxatives rarely agree well. They cause flatulence, pain, and occasionally nausea. In such conditions tonic laxatives are required. In the use of these there are some rules which should be carefully observed. They should be given in small doses, repeated often enough to give the desired effect and no more, and they should be continued until the habit of constipation is completely broken up, and resumed upon the first indication that the trouble is returning. If the adaptation of the remedies is right, the doses can be gradually diminished in quantity and frequency, in place of having to increase the medicine to get the desired effect.

Belladonna stands at the head of the list of agents in the treatment of constipation occurring in gynecological cases. If given alone in small doses, often repeated, it will answer in some cases. It is of course seldom given alone, but in combination with other laxatives.

Nux vomica is often employed, but it is objectionable. It acts only for the time, and if continued long it loses its effect, requiring a larger dose to be given in order to obtain any effect at all. The most that can be said of it in the management of constipation is that it may be useful at the beginning of the treatment to give the patient a start in the right direction in cases of marked debility.

One of the most reliable combinations that I have found is one grain of sulphate of quinine, one-tenth of a grain of the extract of belladonna, and half a grain of the compound extract of colocynth, made into a pill. One of these given with each meal has helped more cases than any other prescription. As the patient gains strength the number of doses can be reduced to two or one a day, and finally half of a pill every day or every second day.

In cases of amenorrhœa or scanty menstruation the aqueous extract of aloes may be used in place of the colocynth, a quarter of a grain usually being sufficient. When pills are objectionable to the patient, the fluid extract of podophyllum, one or two drops, tincture of colocynth, six drops, and fluid extract of belladonna, one-third of a minim, should be given after meals in a little glycerin and some aromatic which is agreeable, like peppermint-water or cardamom. The compound licorice powder should not be forgotten. A teaspoonful of this preparation, if carefully prepared by being thoroughly pulverized and mixed and given at bed-time, will do well in many cases.

We now come to the consideration of the therapeutic agents which act upon the sexual organs through the ultimate general nutrition. Some of these agents act through the circulation and innervation, modifying the state or quantity of the blood which supplies the sexual organs, thereby affecting their condition and action. The type of this class is ergot. This agent is well known to possess very extraordinary power to excite muscular action in the uterus, but its greatest value is limited to obstetric practice. There it is the most certain and reliable of all medicinal agents in its uniform action under given circumstances. It is far from being so useful in the practice of gynecology. Muscular contraction of the uterus can only be possible when the organ is developed either by gestation or intra-uterine neoplasms; hence ergot is not often efficient in disorders of the uterus.

It has been claimed that ergot, by causing contraction of the muscular walls of the blood-vessels, is valuable in all congested states of the uterus, but, practically, this is not of much account. It is true that the ergot causes contraction of the blood-vessels generally, but in order to make it of much value in local congestions it requires to be given in large doses and long continued, so that long before much benefit could be gained in disease of the uterus its constitutional effects become so marked that it has to be suspended.

Practically, then, its use in gynecology is limited mostly to cases of intra-uterine growths where it is desirable to cause contraction of the uterus in the hope of arresting their growth or expelling them, and in subinvolution of the uterus, where the object is to cause active contraction of the uterus in the hope of stimulating the process of involution.

When the uterus after confinement remains large, soft, and vascular,

ergot does appear to have some effect in condensing the tissues and lessening the congestion. Still, granting all this, ergot is not sufficient alone to complete involution in all cases, but it may be a valuable aid.

Alteratives which favorably influence general nutrition often act indirectly upon diseases of the sexual organs. The principal remedies of this class are mercury, iodine, and arsenic. They are of the most service in overcoming the evil results of the products of bygone inflammations, such as cellulitis and peritonitis, the latter especially. They are perhaps most efficacious in ovarian inflammations of a subacute character. They have been used also in endometritis, but they do not seem to accomplish much in that affection.

To favor the absorption of the products of pelvic cellulitis and peritonitis the bichloride of mercury, combined with iron when necessary, has been commended, and no doubt it is of great service. After using it for a time it may be followed by the iodide of sodium if the general nutrition permits it. The iodide of iron will answer better when iron is indicated.

The selection of these agents should be made according to the condition of the patient of course. When general disintegration is sluggish and there is much flesh, the mercury, followed by iodine, generally is best, and when there is anæmia the iodide of iron should have the preference. To be effectual these remedies should be continued for a long time. A similar course of medication is indicated in old inflammatory diseases of the ovaries and Fallopian tubes.

Chloride of gold has recently been commended in diseases of the ovaries. I presume it should be classed among the alteratives, but I have not seen any effects from it that would warrant my indorsing it, neither have I heard any very reliable records in its favor.

In regard to arsenic, its well-known effects upon the nutrition of the skin and mucous membranes entitle it to consideration in the treatment of obstinate inflammatory diseases of the uterus and Fallopian tubes. It should be given in small doses (two or three drops of Fowler's solution) and continued for a long time. When given in this way it will apparently improve the nutrition of the mucous membrane of the uterus, judging from my observations in the management of cases of obstinate cervical catarrh and membranous dysmenorrhœa.

There is another class of remedies—quite a large one—which act mostly through the nervous system, and upon which the gynecologist greatly relies. This class may be subdivided into nerve-tonics and sedatives. Of those classed as tonics, some may be considered as stimulants by therapeutists, but it will suffice for the present purpose to say that under the head of tonics I shall class all those that temporarily or permanently increase nerve-force. Nux vomica is an agent which acts well in cases of marked debility, and is often quite effectual in cases in

which there is general weakness of the nervous system due to uterine or ovarian diseases. It is claimed by some to exert a marked tonic effect upon the sexual organs, and its effect as a general tonic is fully understood. It is only temporary in its effects, however, and if long continued proves injurious. If given for a length of time, it is observed that larger doses are necessary to give the desired effect, and when the medicine is withdrawn a lowering of the nerve-force takes place. In this it resembles in its action the alcoholic stimulants. As a remedy, then, it is only to be used at the beginning of the treatment to sustain the patient until more permanent restoratives have had time to build up the strength. To start the case in the way of improvement is the chief office of this remedy.

Belladonna and agents belonging to that class, when given in small doses at regular intervals, exert a decided tonic influence, especially upon the organic nervous system, while at the same time the effect upon the sexual organs is slightly tonic and sedative. General nutrition is aided by them, and patients will often acquire better spirits and sleep better while taking them.

Hydrobromide of hyoscine is a new remedy, which acts in a way similar to belladonna, and is even more efficient. When given in doses of the one-hundredth of a grain, more or less according to the case, it gives an improved tone to the nervous system, improves the capillary circulation, and relieves some of the wandering, ill-defined pains so commonly associated with diseases of the uterus and ovaries.

Zinc and phosphorus represent the class of nerve-tonics which aid in restoring the nervous system to a better state, and it may be said of all these that so far as they improve the general system, just so far do they aid in relieving diseases of the sexual organs.

Quinine is an agent worthy of the special attention of the gynecologist. It is well known that quinine will stimulate uterine contractions during labor in case the nervous system becomes exhausted, and presumably it may improve local innervation in disease. It is also a valuable remedy in cases of neuralgic pains in the pelvis. In view of these facts it is reasonable to suppose that its action upon the pelvic organs may be more than that of the ordinary tonics. At any rate, as a general tonic it ranks among the highest in the management of uterine and ovarian diseases.

Electricity has been more urgently commended perhaps than any other agent in the practice of gynecology. After carefully examining the testimony given in our literature, and making such clinical observations as I could regarding electricity, I have come to the conclusion that when used generally it is capable of improving nutrition, and in some cases it quiets nervous irritation, and the sexual organs come in for their share of the general improvement; but general faradization

or galvanization has no direct or specific effect when used in this way. Regarding the local effects of electricity something will be said farther on.

Sedatives are so frequently called for in the practice of gynecology that the subject requires its full share of attention. In view of the suffering of those who have diseases of the sexual organs, the practitioner naturally turns to opium as the most potent remedy, but in this branch of practice it is often the most disastrous in the ultimate results of its use.

In acute disease, like pelvic peritonitis and ovaritis, opium is the remedy of most value, but in the less acute affections it is seldom curative and nearly always dangerous—dangerous because of the great facility with which this class of patients acquire the opium habit. No remedy can be more gratifying to both patient and physician in its immediate results; but it relieves only, does not cure in many cases, and therefore should not be used when it can be avoided.

A similar though less severe verdict may be rendered in regard to alcoholic stimulants. These are seldom well borne by patients with diseases of the pelvic organs, and hence there is less danger in prescribing them, because there is less likelihood of patients acquiring an abnormal desire for them.

Chloral hydrate may be mentioned in this connection, only to suggest caution regarding its use by the gynecologist. The most that it can do is to produce sleep. It does not in small doses relieve pain as opium does, and, more than that, chloral is more liable to produce irritation of the sexual organs than opium. Several patients who have tried opium and chloral to ease their sufferings have told me that chloral caused sexual excitation, while opium subdued it.

Bromide of sodium is the great sedative in the practice of the gynecologist. It not only relieves much of the suffering, but it has, through its sedative effect, a curative influence in many of the diseases of the sexual organs. By relieving the nervous excitation and irritability it lessens the congestion of the pelvic organs, and hence tends to relieve many of the inflammatory diseases and functional derangements. There are two ways of using bromides, according to the effect desired—the one to break up nervous symptoms, the other to induce sleep. Full doses, repeated until the specific effects are produced, should be given when the object is to break up a train of nervous symptoms due to disease of the pelvic organs. When this is accomplished the patient will generally emerge from the effects of the bromide in a quieter and better condition to respond to the general restorative treatment.

In some of the weak, nervous cases one may be at times afraid to push the bromides very far, for fear that the prostrating effects might prove dangerous. Caution in this is wise and necessary, and yet the

patient must be brought under the remedy to get the full benefit. To accomplish the good and avoid the danger small doses of nux vomica should be combined with the bromide. Digitalis also may be added if the heart-action is weak.

While advocating the liberal use of bromide I would say that it should not be long continued. I rarely give this drug longer than a week or two, except it may be one dose in the afternoon and evening to prolong the night's sleep.

When bromide is not well borne or does not give the desired effect, cannabis indica may be tried. Conium also does well, and may be combined with camphor, croton chloral, lupulin, belladonna, asafœtida, and castor, but they all may be considered as substitutes to be used in rare cases when the bromides fail.

Next to the bromides among nerve-sedatives, and perhaps first among them, is massage. The introduction of this treatment into rational therapeutics was a most valuable contribution. It is employed usually to aid nutrition, and for this purpose it is of great benefit, but it is an excellent nerve-sedative. A skilful nurse can by systematic manipulation soothe the tegumentary nerves and produce that normal tiredness which invites rest and sleep. That which used to be the property of ignorant and designing magnetic rubbers is now modified and adapted to rational use. It is a "stone which the builders rejected" for a time, but now fills an important place in therapeutics.

This massage is true passive exercise, the only way that exercise can be given without exhausting or taxing the nerve-centres. By this means the muscular system can be toned down to the condition adapted to normal rest, and a like effect appears to be produced upon the spinal nerves. This therapeutic agent is of so much importance that reference will be again made to it as we proceed. This part of the subject would be incomplete without mentioning electricity. That this agent is useful most practitioners will acknowledge. In my own practice I have not been satisfied that it accomplishes much, excepting in a certain class of cases.

Those who suffer from functional derangements of the sexual organs and nervous system because of imperfect development or misdirected and unoccupied nerve-energies—in short, spoiled girls and women—require a very different course of treatment from those who suffer from more definite diseases. The great object is to find mental and physical employment for them which will turn their attention away from themselves. Here also isolation is an important factor, but it is not for the sake of rest, but change of occupation.

To remove such cases from the influence of kind but unwise friends, and place them in the more wholesome society of a nurse and physician, is a great gain. And then their whole time should be profitably occu-

pied. A portion of the day should be devoted to the Turkish or Roman bath, and if there is a well-defined hysterical element present, the cold pack, shower-bath, and needle-bath may all be tried in turn. In the external use of water the rule is warm water for the weak and nervous, and cold water for the strong and hysterical.

Gymnastic exercise, adapted to the condition of each patient, is one of the most valuable means in the management of such cases, and should come in after strength has been gained by massage. If there is any pelvic disease which forbids the use of the ordinary calisthenics, the extremities should be thoroughly exercised while the patient is reclining. There is no one agent so potent in relieving chronic congestion of the internal organs as muscular exercise. It is equally efficient in quieting that nervous irritability which is expressed in the hosts of wandering aches and pains which torment this class of patients.

The condition of a brain which has for a long time been wholly occupied in looking after the frailties of the body can be greatly improved by directing the will-power to the exercise of the muscles. I frequently see women who because of some uterine displacement or circumscribed pelvic cellulitis are directed to rest in bed without any mental or physical employment. Such imprisonment is sufficient to make an invalid of the best kind of human material. To keep an army in good condition requires constant occupation of both officers and men, and this rule applies to many of our sick folks. Our medical literature could well afford to have a chapter on Employment for Invalids.

After muscular exercise, electricity comes in to fill up time, and is useful to that extent at least. Patients who have some hysterical elements associated with these diseases of their pelvic organs are usually most benefited by electricity. So says Rosenthal in his book on *Diseases of the Nervous System*, and my own limited experience agrees with this. Some of them, perhaps many of them, are feeble and require medication. Soothing medicines and nerve-tonics may all be required, and should be employed while the massage, gymnastics, and baths are being used.

The local treatment of the diseases of the uterus, the one organ of the sexual system which is most amenable to local treatment, will be fully discussed elsewhere. Some general remarks, however, on the principal facts in uterine therapeutics may be permitted in this connection.

Local treatment of diseases of the uterus should be employed with the view of accomplishing two objects: First, to remove the disease; and second, to restore the organ to its normal condition. It will at once be inferred that if the first object is attained the second will follow as a natural consequence, but it may or may not, according to the cha-

racter of the treatment employed. I am satisfied that in times past, and even at present, much of the treatment of uterine disease, while it arrests the inflammatory trouble, proves so destructive to the normal structure of the organ as to render the last condition of the patient worse than the first.

Disregarding much of the confusing and contradictory literature on the subject, I shall endeavor to fix attention upon a few points which I regard as well established and likely to be of service in the treatment of uterine disease.

The important questions which come up for consideration on this subject are—first, to what part of the affected organs can applications be made? second, what curative agents shall be employed? and third, how shall they be applied?

Turning to textbooks or the current literature of the profession in search of an answer to the first question, I find the greatest diversity of opinions. The pioneer gynecologists of Europe, such as M. Gendrin, M. Jobert de Lamballe, Bennet, and Simpson, rarely if ever made applications beyond the os internum, believing that uterine inflammation could be cured by treating the cervix and cervical canal. On the other hand, we find that Aran, Scanzoni, and Gantillon, and in our own country Dr. Henry Miller (who, by the way, was the first to employ intra-uterine medication in this country), Kammerer, Nott, Peaslee, and many others, relied to a very great extent on intra-uterine applications for the relief of endometritis and uterine catarrh. Many more names might be mentioned to show the want of harmony among physicians on this point, but no useful knowledge could be gained thereby.

The only point of interest which we can learn from this review is that, so far as we can judge, intra-uterine medication is more extensively employed now than formerly. Believing, then, that time tends to drift us to the side of correct therapeutics, it may be inferred that local applications to a part or to the entire lining membrane of the uterine cavity are sometimes necessary, if not indispensable, in treating endometritis.

In seeking an answer to the second question we encounter a variety of medicinal agents, ranging from the actual cautery to the blandest anodyne lotion. Reviewing the nature and effects of the various remedies used in the treatment of uterine disease, we could in no way be guided thereby in making a selection.

Bearing in mind, however, the second object to be gained—namely, to restore the organ to health and leave it uninjured in structure—the therapeutist is bound at once to reject all the more powerful and destructive agents, such as nitric acid and chromic acid, caustic potash, and the actual cautery. All these have been used, and are now, though less extensively, I trust, than formerly, in the treatment of simple

chronic endometritis or hyperæmia of the mucous membrane of the cavity of the uterus.

Leaving out of account the value of these potent agents in the treatment of malignant diseases of the uterus, I desire to be distinctly understood as opposed to their use in the treatment of the benign uterine disease. I readily admit that inflammation of a mucous membrane can and may have been "cured," as the expression is, by such means. The surgeon can "cure" a gleet by burning out the whole mucous membrane of the urethra with caustics. There would be nothing left there but a cicatrix, which could not secrete the glairy mucous discharge of gleet; but most men, I am inclined to think, would prefer the disease to such treatment with such results. The oculist could "cure" a chronic conjunctivitis in the same way, but I fear the eye would be hardly presentable afterward, and it would surely fail to perform its function. Still, there are those who treat the same affection of the mucous membrane of the uterus with these destructive agents, and the results which follow can be easily imagined. It may be argued, I am aware, that strong caustics are being used less and less by the profession in the treatment of uterine disease, and I am glad to believe that such is the case. The nitric and chromic acids and other caustics are being laid aside, but only, I fear, to give place in some cases to new but none the less destructive agents: I allude to galvano-cautery and thermo-cautery. These have become the "fashionable" caustics or cauteries of the day, and I most thoroughly appreciate their value in the treatment of malignant disease when the destruction of tissue is called for. But in the treatment of benign inflammation they cannot fail to work a great and uncalled-for destruction, like the other agents used in the past.

In the management of uterine diseases one may be guided by some of the generally accepted rules laid down by surgeons for the treatment of inflammation generally—viz.: place the diseased organ at rest, quiet irritation by sedatives, and relieve the congestion by depletion, astringents, alteratives, and sedatives. To accomplish these objects we must employ all the improved means brought forward by modern investigation, changing and adapting them so as to meet the peculiarities of each case. First, then, secure rest by having the patient abstain from long-continued standing or walking and from over-excitement of the sexual function. If the uterus is displaced, replace it, and sustain it in its normal position by the support of a well-fitting pessary if need be.

To relieve pain and quiet the irritation a vaginal or rectal suppository made of extract of belladonna, one-eighth to one-half grain, with cocoa-butter, used at bedtime, will often give great relief. Suppositories of iodoform and of conium are also of service when used in the same way.

I desire to call attention specially to the next agent—namely, depletion—because I regard it as a remedy of some value. In making this statement I am aware that I encounter much professional prejudice. Bloodletting has ceased to be the fashion of the day. The lancet is condemned as a "little instrument of mighty mischief." Few of the younger members of the profession have ever seen a patient bled. Local depletion held its own some time after general venesection was to a great extent abandoned, but even this has gradually given way to the popular prejudice of the day. Nevertheless, the fact in surgical therapeutics remains true as ever, that the removal of blood directly from the vessels of an inflamed or congested organ gives some temporary relief.

Frequent repetition of bloodletting should be avoided, but when a case is first seen in which there is marked congestion the abstraction of a little blood by a few punctures around the os externum, or the superficial scarification of the mucous membrane about the external os, will pave the way to other applications. To practise depletion exclusively and persistently, as some of the older gynecologists did, is certainly injurious, but as a means to be employed in suitable cases it is worthy of consideration.

Hot water used as a vaginal douche is an antiphlogistic of much value. It depletes the parts by stimulating the circulation, and is withal something of a local sedative. It is an exceedingly popular remedy at the present time, and is used rather indiscriminately in all diseases of the pelvic organs and with heroic persistency. If properly used, it gives relief in congestion of the vagina and uterus, and in cellulitis when the inflammation is limited to the cellular tissue about the cervix uteri. It is also of service in the passive congestion which often accompanies imperfect involution, but in pelvic peritonitis, salpingitis, and ovaritis it is often harmful.

The most effectual way of using the hot-water douche is to place the patient on her back over a bed-pan and use a fountain syringe. The reservoir should be elevated enough to give the required force to the stream. The vaginal tube should be perforated on the sides near the end, but the extreme end should be closed. This will guard against forcing water into the uterus. The temperature of the water may range from 95° to 110° F., the higher temperature being used only when agreeable to the patient. The quantity to be used may be from one to two gallons. When too large a quantity at a high temperature is used at the beginning of treatment, it sometimes causes faintness. It is well, then, to begin at a lower temperature, and gradually increase the quantity as the patient gets used to it. It is also very liable to do harm when used, as it often is, after plastic operations about the cervix uteri and perineum.

Another means of depletion was introduced by J. Marion Sims. He used a small vaginal tampon of cotton saturated with glycerin, which caused free exosmosis from the mucous membrane, thereby relieving capillary engorgement and œdema.

Position has much influence in modifying the circulation in the pelvis, and hence patients should avoid the too common habit of sitting all day in a chair because they suffer when they walk. Short periods of walking or riding, followed by rest in the recumbent position, should be directed.

When from long-continued congestion the mucous membrane of the cavity of the uterus has become hypertrophied, giving rise to that condition known now as endometritis polyposa, the use of the curette gives the most prompt relief. The blunt instrument should always be used, because it is perfectly effective and free from danger. Dilatation of the cervix with tents as a preliminary to the use of the curette should be avoided. No such dilatation is needed, as a rule. When the mucous membrane is hypertrophied, the canal of the cervix is usually sufficiently dilated to admit a curette large enough to do the work. By carefully adhering to this rule of practice the pain and danger from the use of the tents are avoided, which are great advantages to the patient. In the great majority of cases of corporeal endometritis with thickening of the mucous membrane the use of the curette gives prompt and permanent relief. Still, there are some who may require other local treatment.

There is so much risk in treating the mucous membrane of the cavity of the body of the uterus that there are certain precautions which should be kept in mind. The principal rules for guidance may be formulated as follows: That intra-uterine applications should not be used until other means have been thoroughly tried and have failed; the uterus should be in or near its normal position; the cervix uteri should be sufficiently dilated to allow the fluid to escape from the cavity of the body; such an instrument should be used as will aid in effecting a free reflux or regurgitation.

After having carefully freed the cervical canal from the secretion, the easiest and most effectual way of making applications is to use a glass pipette with a small rubber bulb at one end, the other end being curved like a uterine sound. The solution to be used is drawn up into the glass tube by the rubber bulb; the instrument is then passed up to the os internum or to the fundus uteri if desired, and as it is withdrawn pressure upon the bulb forces out the solution and brings it in contact with the entire lining of the canal. The method generally in use, of dipping a probe wrapped in cotton into the solution, and passing that up into the canal, is very unsatisfactory. The cotton on the probe injures the mucous membrane, and the solution is deposited about the

os externum, very little if any getting up into the canal. The injection or instillation should be made very slowly, because the uterus will not tolerate distension.

The blandest fluid ought to be tried first, in order to test the tolerance of the uterus; a little warm water with table-salt I have found agreeable; perhaps cocaine would be the best; and no agent whatever should be used which might permanently injure the mucous membrane.

In most cases the canal of the cervix is sufficiently open to permit intra-uterine applications, but it may be necessary to produce dilatation as a preliminary step. When such is the case the use of the uterine dilator will answer.

The treatment of the cervical canal is fortunately simpler, being more easy to reach and much more tolerant of irritation. The only difficulty in the way of making applications is the tenacious secretion which fills the canal. This should be removed with a small curette before making the application.

Regarding the agents to be used in cervix or body a long list might be given. It will suffice to say that the safest and most efficient are mild solutions of sulphate of zinc, chloride of zinc, nitrate of silver, tannic acid, tincture of iodine, and carbolic acid, my own preference for general use being tincture of iodine two parts and carbolic acid one part. The frequency with which these local applications should be made depends upon the nature of the lesions. In ordinary cervical and corporeal endometritis once every five or six days will suffice. This gives time for the tissues to fully profit by the application made before it is repeated.

I am aware that the practice with some is to make local applications every day or every other day, but I know that this constant manipulating is irritating and does more harm than good.

Cocaine, the therapeutical action of which has recently been discovered, is a most valuable addition to the materia medica. The gynecologist has long felt the need of some agent that would, when applied locally, act as an anæsthetic, and cocaine has largely supplied the much-needed agent. Its chief value is in rendering the parts to which it is applied less sensitive during the application of curative agents which are necessarily painful. Cocaine lessens the blood-supply in the parts to which it is applied, at the same time that it benumbs them, and on that account it was hoped that cocaine would be a valuable remedy in inflammatory affections. It appears, however, that its effects are very temporary, and it remains to be seen how efficacious it may be in this respect.

It has also been used as a local anæsthetic while performing plastic operations upon the pelvic organs. In this it has proved to be too superficial in its action to control the pain caused by wounding the deeper

nerves. Perhaps by using it hypodermically or applying it to the exposed parts as the operation progresses it may prove of yet greater capabilities. So far, I have found it very useful in relieving tenderness of the vulva, which makes examinations of the pelvic organs by touch and speculum otherwise impossible.

It also relieves the painful urination of urethritis, and also the pain caused by injections in this affection if used frequently. It also benumbs the mucous membrane of the cervical canal, so that the uterine sound or dilator can be used in sensitive cases without the usual pain. Possibly, it may relieve the sensitiveness of the corporeal mucous membrane, thereby rendering intra-uterine medication less painful and dangerous. But this has yet to be demonstrated.

To carry out a systematic course of treatment, such as has been briefly referred to here, is difficult in general practice. Granting that one has the requisite medical and surgical knowledge, it is difficult to obtain the means necessary. In private life proper nursing is hard to obtain. There are few who can afford a well-trained nurse for any length of time, and if that obstacle be overcome the constant interference of relatives and friends thwarts the efforts of both physician and nurse to obtain and keep complete control of the patient. This throws extra care upon the physician or surgeon, and limits the number of cases that one can take charge of. In view of these facts it may be concluded that one can treat a larger number of cases in an institution especially arranged for that purpose with more ease and satisfaction than in private practice.

ELECTRICITY IN GYNECOLOGY.

By A. D. ROCKWELL, A. M., M. D.,
New York.

While electricity as a therapeutic agent undoubtedly finds its widest field in neurological cases, yet it is by no means to be restricted to these conditions. In every special department of medicine it must at times enter as an important factor, and those who would keep abreast the current must recognize this fact. Ophthalmology, laryngology, dermatology, even obstetrics, own its value, but it is in the treatment of certain gynecological cases that its greatest efficacy lies. I have for years held that it should occupy a far higher place in the armamentarium of the gynecologist than it has yet occupied, but until experts in this department give the subject their personal attention by making themselves familiar with the physics and physiology of electricity and the differential indications for its use, and finally supplement theoretical knowledge by clinical experience, the popularization of this invaluable remedy for the relief of the diseases of women will be slow.

Almost every disease peculiar to women has been treated by electricity, and if the many remarkable results recorded could be accepted as typical of the ordinary effects of electrization, it might be considered almost a panacea for this class of cases.

While disorders of menstruation, engorgements, flexions, prolapsus, atrophy, etc. have all been treated with more or less success, it should always be borne in mind that in the majority of the diseases peculiar to women this success has followed when the electrical has supplemented, and not superseded, other and more thoroughly approved methods of treatment. In estimating the value of electricity not only in gynecology but in every other class of disease, it is essential that its general therapeutical action be properly appreciated. The old idea that it was merely a stimulant, useful to prick up paralyzed muscles, limited its application for many years to the various forms of paralysis.

The acceptance of the view that electricity is a tonic, and as such has a powerful influence over nutrition, has wrought a revolution in electrotherapeutics, and readily accounts for its value in such a wide variety of diseases.

But not only is electricity a stimulant and a tonic, but under certain

conditions it acts as one of our most efficacious sedatives, and, paradoxical as the term "stimulating sedative tonic" may at first appear, all experience is in favor of this term as expressive of its place in medicine.

The stimulating effects of electricity are in reality far less important than those of sedation and improvement in nutrition, and only because its power of stimulation was formerly regarded as almost the exclusive test for the use of electricity in medicine can we account for its slight progress in professional popularity through so many years. We now know that it relieves many forms of pain, gives tone to the system, and frequently improves nutrition after ordinary tonics and sedatives have failed.

As in many of the diseases peculiar to women it is of prime importance to improve both the local and the general nutrition, and to produce not only stimulating but sedative effects, it is quite in order here to say a few words in regard to the methods by which these results can be obtained.

General Faradization.

Electricity is no exception to the general law that in order to obtain the constitutional tonic effects of a remedy the whole system must be brought under its influence. It is not a whit more irrational to expect one to appreciate the full tonic effects of cold water by washing one arm only than it is to expect the full effects of electricity by using it locally. Experience here confirms analogy, and teaches that the constitutional tonic effects of electricity can only be obtained by making the applications all over the person and to the central nervous system. The results of these methods are variously modified according to the conditions of disease or special idiosyncrasies of the patient.

It may be here remarked, also, that there is no remedy to the effects of which there is a more varying degree of susceptibility. Some patients, for example—and perhaps the majority—experience a feeling of enlivenment and exhilaration after a judiciously-directed general application. In others the tendency may be to sleep, and in such cases the patient should be permitted, and even enjoined, to quietly repose for some time after. Because of this disposition to sleep which is so often observed, it becomes in many cases desirable, especially when insomnia is present, to administer the applications at night before retiring. The relief from indefinable nervous pains and from general and local weariness is a very agreeable and not infrequent temporary effect of general faradization. Sometimes this feeling of relief lasts for several hours, and at other times for a much shorter period, but in either case persistent efforts will, as a rule, result in more or less permanent benefit.

The most thorough form of general faradization demands that the whole surface of the body, from the crown of the head to the soles of the feet, shall be successively brought under the influence of the faradic current. For this purpose the feet of the patient may be placed upon a broad piece of copper, to which the negative pole is attached, while the positive (either the moistened hand of the operator or a fine and soft sponge enclosing a metal ball) is applied to the various portions of the body. To successfully utilize general faradization requires some mechanical dexterity, entire familiarity with the instruments required, a complete knowledge of electro-therapeutical anatomy, and a personal acquaintance with the sensations and behavior of all portions of the body under the different electric currents. The true method of learning the art of general faradization is by repeated observations of its application to the *living* subject, by personal experience of its sensations and results at the hands of practised adepts, and by careful experimenting on diverse temperaments and in opposite states of disease.[1]

Localized Electrization.

As the term sufficiently indicates, localized electrization is supposed to affect but a comparatively limited portion of the body, and its effects, primary, secondary, and permanent, are not at all such as those that have just been considered.

The object of localized electrization is to confine the direct action of the current, so far as possible, to some particular part of the body. This is accomplished by placing electrodes so that the current in passing from one to the other shall chiefly traverse the special part to be affected. When the current is localized by means of moistened electrodes, it diffuses itself through the body between the electrodes in various directions. The extent of this diffusion will be variously modified by the relative position of the electrodes and the structure and relation of the parts that lie between them. It is manifest also that the effects of the current will be greatest near the electrodes and least at the farthest point between them. The strength of the current being the same, small electrodes are more painful than those with a broad surface, and metallic more than wet sponge or flannel. The least painful form of artificial electrode is a soft sponge with a broad surface and well moistened, or, better still, one of absorbent cotton covered with chamois-skin.

Localized electrization has to a limited extent the same direct effect on the part to which the application is made that general electrization has on the whole body. The leading and general effect of localized

[1] For fuller details of this method the reader is referred to Beard and Rockwell's *Practical Treatise on Medical and Surgical Electricity.*

electrization, and one which is a complex result of the various special effects, is improvement in nutrition. Localized electrization of an atrophied or poorly-nourished muscle causes that muscle to improve in size and strength; localized electrization of an atrophied or poorly-nourished organ, as the uterus, causes it to increase in size and improve in functional activity. When the nutrition of an atrophied part is improved, it grows larger; when the nutrition of an hypertrophied part is improved, it grows smaller. In both atrophy and subinvolution of the uterus I have in various instances verified this statement.

The local treatment of the uterus and its appendages may be either external or internal. The external treatment consists simply in placing one pole in front over some portion of the abdomen, according to the indications of the case, and the other over the lower lumbar region. This method is frequently of essential service in the disorders of menstruation and in ovarian pain, and in the case of virgins should certainly be attempted before resorting to the internal method. The localization of the current in the uterine organs is in this way of course only partial, and far less effective than internal applications, and the benefit derived is undoubtedly in part due to the effects of the current on the lower part of the spinal cord and the abdominal ganglia of the sympathetic.

The internal treatment of the uterus and ovaries may be effected in several ways. Usually, the introduction of one pole is sufficient, the other being applied externally either at the nape of the neck near the sixth cervical vertebra, over the lumbar region, or, as is most generally the case, on the abdomen, according to the special indications of the case in hand.

The internal electrode may be applied either to the cervix uteri, to the interior of the uterus, or in the rectum. In the treatment of displacements it has been customary to apply both poles internally, one to the uterus and the other in the rectum or bladder, according to the character of the flexion. Applications to the cervix are made by means of an insulated electrode with a metallic bulb, or, instead of the bulb, small plates may be used to clasp the os. Excepting where cauterizing effects are desired, the internal electrode should be covered with chamois, soft sponge, or absorbent cotton. An ordinary Sims sound, if insulated to within about an inch of the extremity, answers very well for an intra-uterine electrode.

The vagina may be treated by a straight or slightly curved metal electrode—a method which may sometimes prove useful in the treatment of leucorrhœa and prolapsus.[1] When we desire in these local applications the mechanical rather than the chemical effects of elec-

[1] These various electrodes will be found illustrated in the catalogues of most instrument manufacturers.

tricity, as is the case in the treatment of displacements, the faradic current is to be preferred to the galvanic.

It is an interesting and important fact to be borne in mind that internal are relatively far less painful than external applications. Very many, therefore, in first attempting this method of treatment are surprised that the sensations under the broad surface of the external electrode are complained of more than those at the point of contact of the small internal electrode. It may be here stated, in general, that the negative pole is far more frequently indicated for internal applications than the positive. More specific statements will be made when considering individual diseases.

Strength of Current.—In the use of electricity in gynecology, as well as in other forms of disease, it is essential that the strength of the current be always known to the operator. The variation of the strength of the faradic current cannot be so readily appreciated by any instrument of precision as can that of the galvanic current, and fortunately the same necessity does not exist. The strength of the former can always be approximately estimated by the appliances attached to the apparatus.

For the intelligent use of galvanism, however, a galvanometer, registered in milliampères, is of the first importance, and no one can hope to perform satisfactory work without it. There can be no question but that too weak currents have hitherto been used in the treatment of many diseases of the female sexual apparatus. Various conditions which I formerly failed to relieve have of late years responded far more readily to treatment, simply because of the greater intensity of current that I have, with increased boldness, attempted. Opinions may differ in regard to the number of milliampères necessary to accomplish a given object. Some observers, and notably Apostoli in France, make use of most powerful currents; in the treatment of uterine fibroids and hyperplasia uteri especially his milliampères often registering considerably above a hundred, and Engelmann claims to have gone as high as two hundred and fifty. Excepting for electrolytic purposes, however, it is rarely necessary to use a strength of more than fifty milliampères.

The covering of the metal electrode is not of prime importance, so long as the proper strength of current is attained. This much may, however, be said in regard to electrodes: they vary decidedly as to their conductibility. The ordinary sponge electrode is necessarily bulky, offering a greater resistance to the passage of the current than some others. A large amount of electrical force is therefore lost. This loss cannot be afforded, especially when the physician, as is generally the case, has but a limited number of cells at command. Far better than sponge, in that it conducts more readily and can be changed for

every patient with little expense, is the ordinary absorbent cotton. A thin layer is spread over a flexible metal plate with a covering of chamois.

The size of the external electrode is determined by the strength of the current. It should vary in diameter from two to six inches or more, according as the current varies from five to fifty milliampères in strength. Such details, however, each worker will readily discover for himself. Individuals are so differently susceptible in this respect that no statement in regard to size of electrode is applicable to all. A statement that has been already made I here repeat: It should never be forgotten that the female generative organs are not at all sensitive to electrical applications, whether galvanic or faradic. The most excessive pain may be occasioned and decided escharotic effects follow where the electrode is applied to the skin, while absolutely no sensation has been experienced at the point of contact of the internal electrode. The internal electrode will cause little or no pain even when a strength of fifty and even more milliampères is used, and the only way to obviate the acute burning at the external electrode is to have it very large, covering even the whole abdomen if necessary. For this purpose Apostoli uses a layer of clay over the abdomen. This, however, is not necessary, as a well-covered plate, say of heavy tin-foil, kept in place and closely applied to the skin by a sand-bag, will do equally well.

Disorders of Menstruation.

Amenorrhœa, dysmenorrhœa, and menorrhagia are the symptoms for the relief of which electricity in some form is very frequently indicated, but the measure of success to be obtained by this as by all other methods must depend upon the causes or special character of the symptoms. It is often asserted that electrization acts most capriciously in these affections, but to all who are conversant with uterine pathology these inconsistent results are entirely explicable. Cases that are indiscriminately treated must frequently result in a manner very disappointing.

In offering a favorable prognosis in a given case of suppressed menstruation it is assumed that no serious local pathological condition exists. In cases associated with, and more or less dependent upon, chlorosis or nervous exhaustion the important thing is not to specially stimulate the uterus, but to change the constitutional condition which is the cause of the suppression of the function. Accordingly, the treatment by general faradization, combined with such internal medication as may be specially called for, is generally sufficient without applications directly to the uterus. Indeed, the majority of cases of functional disease of the uterine organs require general as well as localized electrization. There

is no department in which more mistakes have been made by too exclusively local electrical treatment than in gynecology. No case of functional disturbance of the uterus should be abandoned until general as well as external and internal localized electrization has been tried. One of the strongest evidences of the beneficial results to be obtained by general faradization in cases of amenorrhœa lies in the frequently observed fact that, when treated for other conditions, patients not infrequently speak of some change in the character of the menses. In some cases they are brought on before their time—in others, much increased in quantity.

In addition to methods of application there are several other points to be considered. The time of making the applications is not unimportant. It is an advantage, in amenorrhœa at least, to concentrate as many applications as possible during the few days that precede the time for the appearance of the menses. And yet, as the great thing in all but recent and temporary cases is to remove the chlorosis or nervous exhaustion with which the menstrual disorder is associated, and of which it is a prominent factor, the advantage of this is hardly as great as has been supposed by some. Whatever method is used, time is also necessary to ensure results. While it is true that a single application, especially internal, may bring on the menses—may even cause the blood to appear during the sitting—yet in the majority of instances treatment must be more or less protracted in order to ensure permanent relief.

The kind of electricity to be used is also a question of prime importance in the treatment of amenorrhœa. All three forms, galvanic, faradic, and franklinic, have been used successfully, and not infrequently when one kind fails after repeated efforts another succeeds. Experience has not, however, altogether failed to afford some data for the best methods of procedure. In any case of amenorrhœa where the patient is weak and anæmic, with other and well understood evidences of malnutrition, the faradic current is strongly indicated over the galvanic. As already stated, the applications should be general, although the local treatment, when permissible, is always in order and undoubtedly hastens the effects desired. Localized galvanization is, as a rule, not only *not* indicated, but in many cases, as I have had abundant occasion to observe, tends to induce a condition of nervous irritation that is exceedingly unpleasant. It is only as regards the local application that this objection to the use of galvanism holds in these cases. Central galvanization may very effectually supplement the action of general faradization in the hysterically inclined and the sleepless, calming frequently in a wonderful degree and producing refreshing slumber. If, on the contrary, the patient is robust and of a full habit, galvanism is likely to be of far greater service than either faradism or franklinism.

The applications should by preference be local and internal, although

external treatment alone may in many cases be sufficient. As it is often desirable that mechanical effects be produced, it is frequently of service to rapidly interrupt the current, taking care to avoid too powerful contractions of the external muscles. I have frequently known menstruation to follow the use of franklinic electricity, but a considerable experience has convinced me that it is for this purpose not only inferior to dynamic electricity, but in the long run is equal to neither of its two forms, galvanism and faradism. For some unexplainable reason, however, it does in this disease as in several others sometimes act when dynamic electricity has failed, illustrating the limitations of our knowledge of the differential indications for the use of the different forms of electricity. In regard to the choice of poles, it makes little if any difference when the faradic current is used which is selected. In the use of galvanism, however, I most decidedly prefer the positive pole as the internal. Its superiority over the negative pole for the relief of this symptom depends most probably upon its greater influence over unstriped muscular fibre.

Dysmenorrhœa.—The very satisfactory results that frequently follow the applications of electricity in dysmenorrhœa will not be denied by those who have had any adequate experience in its use. Either of the three forms of electricity may be of service, but, as a rule, the galvanic current is far more effective in affording relief than either faradism or franklinism. It is in the so-called neuralgic dysmenorrhœa and that due to spasm of the os uteri that galvanism is more especially called for. External applications alone are sometimes sufficient, but if these fail the case should not be abandoned until the internal method is faithfully tried.

In many cases great relief will follow applications to the cervix uteri after persistent external treatment has failed. To those who understand the physical and chemical effects of galvanism it would seem hardly necessary to say a word against the use of anything but a steady continuous current, yet instances not a few have come under my observation where practitioners have failed to consider this simple point, and have thus occasionally aggravated the symptoms for which relief has been sought. In most cases of ordinary dysmenorrhœa, whether treated externally or internally, my method is to gradually increase the strength of the current without interruptions.

The strength will depend altogether upon the character of the case in hand. Some will bear, and be benefited by, a current of thirty milliampères and more, while others would receive injury rather than benefit from such strong currents. Let the first application be tentative, and the strength best suited to the case will soon be found. When prolonged and strong applications are necessary, the ordinary uterine electrode applied directly against the tissues is some-

times followed by undue local irritation. To avoid this the following method can be followed to advantage: Soft and fine sponges may be carefully packed around the cervix, pressing up against the body of the uterus. Against these is gently but firmly pressed a flat metallic electrode covered with wet chamois-skin. By intercalating a rheostat, and beginning with the least possible current-strength, the number of cells that may gradually and without discomfort be brought into the circuit far exceeds the number that could be used without this precaution. It will be readily understood that in gradually increasing the current in this way it is as important to as gradually decrease it before removing the electrodes.

In amenorrhœa, either pole, when applied to the uterus, may be followed by the best of results. The negative in the subjective sensations that it causes is the stronger, but the positive is decidedly preferable in some cases, because its tendency is to more readily contract the involuntary muscular fibres. In the treatment of neuralgic dysmenorrhœa, also, the positive pole locally applied is undoubtedly preferable. On physiological grounds alone this conclusion might readily enough be reached, but, unfortunately, electro-physiology is as yet but a very uncertain guide in many cases. I have therefore for years carefully observed, and as carefully recorded, the differential effects of the poles in this condition, and have become convinced that the average results are superior when the positive pole is used. When, however, dysmenorrhœa is due to mechanical causes that are well defined, when the nerve-filaments are pressed upon by exudations, when the canal is occluded by chronic inflammatory swellings,—the negative pole is always to be used.

Menorrhagia.—In the electrical treatment of menorrhagia the results are not so frequently efficacious, by any means, as in the forms of disordered menstruation just considered. In very many cases its origin is such that electricity can prove of but little if any value, while there are other cases where the benefit to be derived cannot be overestimated. On the same principle that we use general faradization in cases of amenorrhœa associated with, and perhaps dependent upon, a weak chlorotic condition of system, we make applications of it where similar symptoms are associated in the menorrhagic subject. In not a few such cases I have known simple external treatment by this method to be followed by complete and permanent cessation of the excessive flow and a corresponding improvement in appearance and strength. In menorrhagia due to such local causes as misplacements, intra-uterine morbid growths, certain affections of the ovaries, etc. ordinary electrical applications are of doubtful efficacy. Electrolytic interference, however, where uterine fibroids or polypi are the cause of the excessive flow not infrequently effects most marvellous changes. On the other hand, when

an excessive flow occurs (especially toward the decline of sexual activity), partially dependent perhaps on inactivity of the liver or constipation and associated with a degree of nervous exhaustion, the indications are self-evident, and are excellently met by the powerful constitutional tonic effects of general faradization. A notable illustration of the remarkable results that may follow treatment in such condition was illustrated in a complicated case that I once saw with Dr. W. G. Alling. The patient was a married woman, aged forty-six, who for at least four years had suffered at each menstrual period a frightful loss of blood. The immediate effects were to render her completely colorless and almost pulseless, from which she slowly rallied, to be again similarly reduced by a return of her courses. It is quite evident that if menstruation had occurred every four weeks, the patient could hardly have survived for so long a time her repeated depletions; as it was, she was just enabled, by the aid of a good appetite and vigorous digestion, to regain a measure of strength and color before the recurrence of her trouble. The intervals between the recurrences of menstruation were ordinarily from six weeks to two months. I began treatment by general faradization in the decline of one of these hemorrhages for the relief of the persistent insomnia resulting from her anæmic condition. It aided very greatly in inducing sleep and relieving pain, and markedly hastened returning strength. Shortly after these tentative applications were begun I met, at the house of the patient, Dr. Alling, under whose care she had been a short time before, and from whom she had received continued and judicious treatment, both constitutional and local, but without decided relief. The uterus was found to be three and a half inches in length and slightly retroverted, and when the probe was carried into the cavity at the first examination slight hemorrhage followed its withdrawal and a small fungoid mass came away. Further examination revealed considerable fungoid degeneration of the mucous membrane.

I proposed alternating the general treatment with intravaginal and mild intra-uterine applications (five to eight milliampères). This method of procedure was repeated up to the day of menstruation, the patient in the mean while having regained, with far more than ordinary rapidity, her color and strength. The flow was considerably more profuse than normal, but could not be compared in severity with those that had previously occurred. In ten days the flow ceased, and treatment was continued until the return of the catamenia, when a still greater improvement was evident. For three months this treatment was kept up, when the patient left the city for the summer with the feeling that her recovery was an assured, if not an accomplished, fact. Several years have since elapsed, but there has never been a recurrence of these hemorrhages, and the patient has at all times since been in the enjoyment of excellent if not robust health.

Ovaritis and Ovarian Neuralgia.

Reasoning from analogy and from the well-known physical and physiological effects of electricity, it is quite certain that this agent, in some form and by some of the various methods of application, ought to have a certain value in ovarian neuralgia, and even in the subacute and chronic varieties of ovaritis. Experience very positively confirms these theoretical suggestions, but by no means so uniformly as in congestions and neuralgic pains of a more superficial character.

In any given case of chronic ovarian pain it is impossible to speak positively in regard to the measure of benefit to be obtained by the use of electricity. The only thing to do is to make an effort, and in a certain proportion of cases the results obtained will abundantly reward us for the labor expended.

Nor is it always possible to decide beforehand what form of electricity or what method of application is specially indicated. In the treatment of neuralgic pains in general I have found that certain symptoms, readily enough elicited, are of much value in enabling one to decide as to the *kind* of electricity needed. Reference is made to the effects of pressure, which generally either increases the pain or to a greater or less extent affords a sense of relief. In the first instance galvanism almost invariably is to be preferred to faradism in the local application, although the faradic current in many of these cases may be applied with advantage by the method of general faradization. The surface stimulation has an undeniably beneficial action as a derivative, probably through the reflex influence exerted, while the generally sedative and at the same time tonic action of thorough applications is often seen in an equalization of the circulation and consequent relief of local congestions.

On the contrary, in those forms of pain where firm and prolonged pressure is followed by a sense of relief the faradic current locally applied is, as a rule, far more efficacious. In many cases of this kind I have even known galvanism to aggravate the distress. This principle as to the effects of pressure, although by no means an absolute law, is an exceedingly useful guide in differentiating between the two forms of dynamic electricity for the relief of external neuralgia; and in the same way, although perhaps to a less extent, I have found it valuable in the consideration of the treatment of ovarian pain. As illustrating this point, I briefly refer to the case of a young lady sent me by Dr. T. G. Thomas. This patient was and had been suffering for months from a pain of a dull, aching character in the region of the left ovary. No internal application was made by me: I therefore cannot say as to the sensation that might have been produced by pressure more directly against the ovary, but from without the deepest and firmest pressure

was followed by no sense of discomfort; on the contrary, such pressure was felt to be a grateful relief. Local applications of the faradic current through a period of several weeks appreciably relieved the pain, but failed to entirely dissipate it. Franklinism was now resorted to. The patient, seated on the insulating stool, was subjected to a surface stimulation over the affected part, and with the result, after a few applications, of entirely and permanently relieving the distress for which relief had been sought.

It is in deep-seated, dull, and aching pains that franklinism by means of the roller electrode is especially efficacious, and in some cases of ovarian pain where pressure does not increase the distress it is more efficacious than faradism. In an undoubted case of chronic ovarian inflammation, however, galvanism is without doubt far more efficacious than the other forms of electricity, and in doses of from ten to twenty-five milliampères is often followed by most grateful relief.

Subinvolution, Superinvolution, and Atrophy.

That nutrition may be variously modified by electricity is now an accepted fact, and yet its action upon normal and abnormal tissue may be diametrically opposite. This apparently paradoxical action of electricity is no new thing. We constantly find that it relieves both anæsthesia and hyperæsthesia. It is used successfully to excite torpid excretory processes, and also to restrain this function when too active. In the same way it may cause increase or it may cause diminution in the size of a part or organ. Goitres, for example, are readily reduced in size, and sometimes entirely disappear, under simple external galvanization; and so with other forms of morbid growths. On the other hand, it is well known to all whose experience has been at all extended that normal tissue may be surprisingly developed by persistent local application.

It is perhaps not out of place to say here, as an illustration of this point, that the arms of the author have been much increased in size, and even strength, by the frequent action of a current of faradism on them through a series of years in the line of professional work. Guided, then, by this experience, we may reasonably expect that more or less benefit will follow the application of electricity in the opposite conditions of sub- and superinvolution, and also in atrophy of the uterus. In superinvolution I have had satisfactory experience in but one case, where the condition was due to a dangerous and difficult labor in which it became necessary to dismember the child. For two years menstruation had appeared but two or three times, and upon measurement the uterus was found to be but about one and three-fourths of an inch in length. The patient was treated almost daily for about three months

by internal applications of both faradism and galvanism, when a slight show appeared. The negative pole was used directly to the uterus per vaginam, and occasionally intra-uterine applications were made. At the next menstruation, a few weeks subsequently, the flow was much more abundant. I regret to say that after the first month I neglected to repeat the measurement, and since the rather sudden discontinuance of treatment no opportunity has presented itself. The reappearance of menstruation would, however, seem to be sufficient evidence of the entire success of the efforts made.

Dr. Fordyce Barker, in some remarks made before a late meeting of the American Gynecological Society on superinvolution, declared that but a small proportion of cases could be benefited by any method of treatment. In his opinion very little could be accomplished when the difficulty was associated with evidence of arrested or defective ovulation, while in those cases where benefit was derived there was always evidence of active ovulation. He enumerated as symptoms of the existence of ovulation associated with superinvolution disturbance of the vascular or nervous system at or near the menstrual period, such as intense headache, flushing of the face and congestion of the eye, pelvic pain and sense of dragging, with nausea, vomiting, etc. In the foregoing case some of these symptoms were distinctly marked, and so far forth are confirmatory of Dr. Barker's experience. At stated periods there were severe headache, pelvic pains, and nausea; associated with these symptoms, and far more persistent than any of them, was intense melancholia. With the return of menstruation all these disturbing symptoms disappeared.

In subinvolution of the uterus my experience has been somewhat greater. Among several cases where undoubted amelioration occurred I have in mind one in particular which Dr. T. G. Thomas saw with me and pronounced to be one of subinvolution. The menstruation was excessive, with abundant leucorrhœa, together with other symptoms attributed to the size and weight of the organ. Occasional local applications of the galvanic current wrought within a few months a very great change in the condition of things. The menstruation, instead of being excessive and continuing for nearly a week, became almost scanty, with a duration of only twenty-four hours, the leucorrhœa ceased to annoy her to any extent, and the various other symptoms supposed to be dependent upon the enlarged uterus entirely disappeared. In most, if not all, cases of subinvolution we must depend mainly upon the galvanic current, although the faradic current is by no means useless. The negative pole is applied internally, and a strength of from twenty to forty milliampères is amply sufficient.

Uterine Displacements.

That electricity is capable of being utilized far more than it ever has been in the various forms of uterine displacement, in this country at least, there can be but little doubt. The *rationale* for its use is indeed so clear that from the standpoint of theoretical considerations alone one might be pardoned for regarding it as almost a specific in this class of cases.

The two most important factors that make up the value of electrical applications in displacements are probably the hyperæmia, and especially the contraction of muscular fibre, that follow its use; and as the contraction of a muscle determines the amount of its nutrition, it follows that if a current of electricity is localized in a given point of the uterus, that part will contract, its nutrition be improved, and at the same time counteract any flexion in the opposite direction. It must be confessed, however, that even in experienced and competent hands the results of electrical treatment in this special field have not equalled the brilliant promises of some, and especially of Tripier, who has written much upon this topic. As the effects we desire in these cases are purely mechanical, the faradic current is the form indicated. The simplest and probably least efficacious method is to introduce one electrode behind the os uteri, while the other is applied externally over either the pubes or the sacrum. As the internal electrode is larger than that employed in intra-uterine applications, and the mucous surface not so sensitive, a much stronger current can be employed; and so far forth this method has an advantage over applications to the interior of the uterus. In prolapsus uteri much benefit has often followed this method of treatment by the tone imparted to the relaxed vaginal walls. A more effective localization of the current is accomplished by introducing one electrode into the uterus, while the other is placed externally; but more effective still is the internal use of both poles. In cases of anteflexion, one pole, the curve of its stem corresponding to that of the sacrum, is introduced into the rectum up to the point nearest the posterior wall of the uterus. In this way the current is quite accurately localized in the posterior uterine wall, causing contraction and improving nutrition. In retroflexion the first electrode, instead of being passed into the rectum, is introduced into the bladder and applied to the anterior wall of the uterus. When the faradic current is used—and this form is chiefly indicated—the relative positions of the poles would seem to be of no special importance, although for the intra-uterine electrode the anode is preferred by some, on the theory that it has a greater power over unstriped muscular fibre. Tripier, however, recommends that the negative pole be placed in the uterus, because it is the stronger (in the sense of being more powerfully felt).

The pain is sometimes considerable, and is due to two causes: 1st, the concentrated action of the electricity on the mucous membrane; 2d, the contraction of the uterine fibres. In other cases very little discomfort is produced. By beginning with a very weak current and gradually increasing it a much greater strength can be endured than if this precaution is not observed. In this connection it may be pertinent to the subject to say that when voluntary muscles are subjected to the action of the poles of either a galvanic or electro-magnetic battery contractions instantly occur. These contractions continue, as is well known, during the passage of the faradic current, but quickly relax after the first shock of the galvanic. When, on the contrary, involuntary muscular fibre of which the uterus is composed is subjected to the influence of the electric current movements are not induced until a certain time after the tissues have been acted upon. The movements thus excited continue for a time after the cessation of the current, and do not, as in the case of voluntary muscles, cease as soon as the electrodes are removed.

It has been observed time and time again in the electrical treatment of uterine affections, when the local method only has been used, that marked effects upon the general system have been produced and severe symptoms of hysteria, neuralgia, and nervousness have been greatly ameliorated. If with the local we combine the general or central treatment to which allusion has already been made, these constitutional effects become much more marked. An interesting point to which I have given much observation relates to various nervous symptoms and certain pathological conditions of the female generative organs as they are connected as cause or effect.

This subject need not be discussed here further than to refer to the difficulty that is frequently experienced in forming a correct opinion as to whether various neuralgias and other kinds of pain, together with certain characteristic nervous derangements associated with uterine disorders, exist independently or are dependent upon such disorders. Too frequently, without doubt, such dependence does exist, and all efforts to alleviate the nervous symptoms prove more or less futile until the original uterine difficulty has been overcome. In other cases, as I have demonstrated to my satisfaction many times, severe hysterical symptoms, neuralgias, etc., supposed to be entirely dependent upon disease of the uterus or its appendages, recover in great degree under electrical treatment, while yet no progress has been made in the purely local treatment.

Periuterine Hæmatocele.

Apostoli treats these tumors by the chemical caustic action of the negative pole. A non-retractile fistula is thus made, the tendency of

which is to remain open and with adhesions between the pathological cavity and the external mucous membrane. The strong caustic action obtained by this method modifies the nutrition of these pathological cavities and leads to rapid retrograde metamorphosis. The method is quick in action, and he claims for it perfect safety. It is applicable as well to abscesses, fibromata, interstitial myomata, and extra-uterine cysts.

Ovarian and Fibroid Tumors, Polypi, etc.

In ovarian and fibroid tumors the electrolytic method is undoubtedly worthy of consideration, although the results have not as yet been sufficiently satisfactory, in ovarian tumors at least, to commend themselves strongly to authorities in the department of uterine surgery. The following is an extract from a résumé of what has been attempted and accomplished in the electrolytic treatment of ovarian tumors:[1] "1st. A number of ovarian tumors reported on reliable authority have been completely cured or permanently improved by electrolysis; twenty-eight out of fifty-one cases, or about 55 per cent. 2d. In a number of these cases electrolysis was followed by dangerous (thirteen, or 25.4 per cent.) and even fatal results (nine out of these thirteen, or 17.6 per cent. of the whole fifty-one). 3d. Further, six cases out of fifty-one received neither benefit nor injury from the treatment, and four were only temporarily improved; total, ten, or 19.6 per cent. We thus have a total of twenty-three cases, or 45 per cent., in which the electrolytic treatment failed to accomplish the object for which it was administered. . . . . 6th. Notwithstanding these undoubted cures the percentage of successes of oöphoro-electrolysis (55 per cent.) compares unfavorably with that of ovariotomy (70 to 80 per cent.; Spencer Wells, 78 per cent.—in 1876 as high as 91 per cent.) And so also do the deaths by electrolysis (17.6 per cent.) nearly equal those following ovariotomy in recent years (20 to 30 per cent., to 22 per cent.), and far exceeding those occurring in the last series of fifty-five cases of Spencer Wells (5 or 9 per cent.)"

The method of operation in these cases is simple, and, with a proper knowledge of electro-physics and a greater experience in the details of treatment, it goes without saying that better results ought finally to reward efforts in this direction. While the percentage of cures by electrolysis could, in all probability, never rise as high as in ovariotomy, fatal results ought to be reduced to a minimum. In other words, in those cases where no benefit accrues I believe it to be quite possible to avoid injury in nearly all cases.

In the treatment of uterine fibroids by electrolysis we can rarely

[1] "The Value of Electrolysis in the Treatment of Ovarian Tumors," *Gynecological Transactions*, 1878, by Paul F. Mundé, M. D.

hope to see them disappear entirely; indeed, where ordinary surgical procedure is possible there is no reason for attempting this method. In some cases of an intramural character, however, where radical operative steps are inadmissible, much can be accomplished for the relief of the patient. I have referred elsewhere[1] to the very encouraging results obtained in several such cases, but in no instance was the relief more marked than in a recent case, which is worthy of record as illustrative of the great benefit that may result from the method:

The patient, a maiden lady aged forty-seven, had begun to suffer in this way many years before. She had consulted various authorities both here and abroad—in this country Dr. T. Addis Emmet, who pronounced it a case of intramural fibroid. Without attempting to give dimensions, it is sufficient to say that the tumor was quite large, and while it interfered greatly with easy and rapid locomotion, this was of little consequence compared to the inconvenience and actual distress due to pressure both on the rectum and bladder. The cervix uteri was greatly enlarged, and almost like cartilage in the sensation it gave to the touch: as a result, she suffered much from incontinence of urine, while the constipation was excessive and had to be relieved by frequent injections. The benefit following the absorptive action of the galvanic current in this case was most marked. The neck of the uterus became appreciably softer and very decidedly reduced in bulk, and the patient returned to her home almost entirely relieved of the distressing symptoms from which she had suffered so long.

In those cases where it can be readily accomplished the electrolytic method may be attempted, and in a certain proportion of cases radical results have been said to follow. The very strongest currents must be used, but, notwithstanding, in the majority of cases fibroid tumors, whether internal or external, will not entirely disappear, even under the most thorough electrolytic treatment.

External fibroid tumors indeed are hard and dry—do not in any case readily respond to electrolytic action. In uterine fibroids, however, the process of absorption seems to be more readily excited by electrolysis, and the treatment is worthy of more extended trial in cases not suitable for the knife. There can be no question that by means of negative electro-puncture, and with currents of the strength of forty or fifty milliampères, uterine polypi can be successfully treated. Both Apostoli of France and Engelmann of this country use, however, much stronger currents than this in the electrolytic treatment of fibroid tumors. Engelmann claims to have used as high a strength as two hundred and fifty milliampères with no ill effect. It can seldom, if ever, however, be necessary to attempt such heroic treatment as this, but if ever attempted it should be only through a gradual increase of the current-intensity.

[1] *Lectures on Medical and Surgical Electricity*, p. 106.

In order that such extraordinary intensity of current may not cause great pain, Apostoli uses an electrode for external application sufficiently large to almost entirely cover the abdomen. This electrode is sculptors' clay, held in place by gauze. A material easily obtained, and answering perhaps equally well, is absorbent cotton. A thin layer, sufficient to retain a moderate amount of moisture, may be placed upon a large flexible metal electrode, the cotton being covered by chamois-skin. In the electrolysis of fibroid and other tumors the needle to be introduced into the tumor should, as a rule, be connected with the negative pole. There can indeed be very few exceptions to this rule.

Apostoli teaches that if hemorrhagic tendencies exist the positive needle should be used, since the effect of the positive pole is to arrest hemorrhage through coagulation. If the tumor is easily accessible, needles connected with both poles may be introduced into the tumor. Engelmann teaches that if profuse menorrhagia or metrorrhagia be associated with fibroids, these tendencies must be overcome by positive electro-cauterization before resorting to electrolysis. A platinum sound is used, and a current of one hundred milliampères is applied to the uterine cavity.

In applying the positive pole to mucous membranes, platinum or gold should always be used, since other metal electrodes, such as silver, copper, or steel, readily become oxidized and imbedded in the tissues. In the positive electro-cauterization of hemorrhagic fibroids, which should precede negative electro-puncture, the rule is to use a current-strength of one hundred milliampères or thereabouts. If a copper or silver probe is used, the strength must be much less, not over ten or fifteen milliampères.

For the electrolytic treatment of fibroid tumors, says Engelmann, the "electrodes needed are a gold or platinum sound of ordinary dimensions, and a needle or stylet of the same material (though the steel instrument may be used), well fixed in a firm handle; for puncture through the vagina this instrument should be of a length equal to that of other gynecological instruments, sound or applicator; for both sound and stylet we must have a separate insulator of heavy rubber—better still of glass, which may be kept more thoroughly aseptic. The abdominal or dispersing electrode is a thin plate of lead or tin alloy, as large as it can be used upon the abdomen, averaging six by nine inches, covered with a thin layer of sculptors' clay held in place by gauze, or with punk or absorbent cotton and a soft, thin buckskin cover, which is equally good."

"The shape which admits of the use of the largest possible plate is the oval, or, better still, the modified form of my plate, oval with convexities to avoid the thighs. This electrode is thoroughly soaked in water as warm as is comfortably borne, and snugly adapted to the

abdomen, that it may rest in place a few minutes before treatment is begun, the current then passing more readily, with less pain; the friction, as I may say, caused by the efforts of the electric current to pass the resistance offered by the dry epidermis being possibly a source of pain, certainly lessening the effect of the current by loss of intensity in overcoming the greater resistance. If this precaution is not observed, the operator will find an intense burning during the first few minutes, which lessens, however, as the tissues become soaked; the desired intensity having been attained, notwithstanding that no more cells are inserted into the circuit, the galvanometer will indicate an increase in high intensities of as much as ten milliampères, and yet the pain lessens decidedly if the positive be the dispersing pole. I have even seen it rise from fifty to a hundred milliampères, without augmenting the number of cells, when the abdominal plate had not been placed until the last moment, so that the dry epidermis offered a resistance at first difficult to overcome. In other words, when the epidermis becomes soaked, less resistance is offered, more electricity passes, and if the positive be the dispersing pole the pain is lessened by the anæsthetic effect of the pole, diminished at times to a minimum, though the intensity of the current be increased. Before placing this plate we must examine the abdomen to see if it shows any abrasions or excrescences; if so, they may be covered with a small piece of oiled silk or plaster, as such a spot would be the centre of intense pain if not guarded. An abrasion, a small blister where the epidermis is removed, centres upon itself much of the electric force, which always seeks the best conductor; or if an excrescence the increased pressure would cause a concentration of the current at this point. The plate having been placed, it is covered by a warm, dry towel or a piece of oiled silk, to guard all garments in contact with it from moisture, which may lead to serious colds, to injury, as well as mere discomfort."

"The stylet or sound, whichever is to be used, is steeped in a strong antiseptic solution, as is also the glass or rubber insulator; the vagina also should be cleansed. For electro-cauterization the sound, covered up to two inches of the point by the insulator, is introduced into the uterine cavity with the utmost care; if possible it is preferable to introduce the sound by the sense of touch. If the stylet is used for electro-puncture, the point of entry having been carefully decided upon, the instrument is introduced, the point guarded by the index finger of the left hand, the handle grasped firmly by the right, counter-pressure being made upon the abdominal protuberance. The puncture is then made for a depth of from one to three inches, according to the size of the tumor; the insulating cover is moved close against the vaginal and cervical membrane, and care must be taken that the entire surface of the instrument not in action is guarded. The activity of the battery is now tested; the

rheophores are attached to the electrodes and the screws firmly bound; the galvanometer needle must point directly to zero. The abdominal plate, evenly adapted everywhere, is held down with gentle pressure by the hands of the patient, while the operator either fixes the sound or stylet with an absolutely steady hand or rests it upon some suitable support, as the slightest motion, any jarring of cords or battery in portable batteries, must be avoided. The patient must breathe evenly and steadily, and allow her hands to follow the respiratory heavings of the abdomen; we must see that the thighs nowhere touch the edge of the electrode, and if perchance the probe is to be passed through a speculum, the slightest contact of its metal surface with the pole must be avoided. When any pain or discomfort that may have been caused by the introduction of the instrument has ceased, the current is established and gently increased, in the first sitting, in the course of a minute up to fifty or a hundred milliampères; later, when the sensibilities of the patient have been tested, one hundred and fifty to two hundred, and even two hundred and fifty milliampères, may be attained in the same time. For very sensitive patients I use the water-rheostat, by means of which we can attain the desired intensity, increase and diminish the current, without even the slight shock caused by the addition of element after element; a resistance of five hundred or one thousand ohms is inserted, the number of cells probably needed thus brought into action, and the intensity gradually attained by decreasing the resistance in the rheostat; for the breaking of the current the resistance is increased until it surpasses the intensity of the elements in the circuit."

"The first sitting should not be continued beyond five minutes, the current remaining at its height three minutes, then being slowly reduced. Currents of two hundred milliampères I have continued for eight minutes in later stages of the treatment. During the passage of the current the operator must constantly observe both his galvanometer and the patient. The needle should remain perfectly steady: during the first minute it will show an increase of a few milliampères, but there must be no oscillation, which indicates jarring or shock. The face of the patient and the galvanometer must be constantly observed, and the operator must be on the lookout for any evidence of irregularity: a momentary contact of sound and speculum would produce a terrific shock. If the bare sound should touch the vaginal membrane it would burrow its way and leave a grayish bed; if the thighs touch the edge of the abdominal plate, which must always be covered by the overlapping conductor, an intense burning is experienced—if not so covered, a shock; and these shocks are trying, if not dangerous, with such intensities. The most intense shock is caused by a carelessness of which no one who ventures upon this treatment should be guilty, the sudden breaking of any one of the connections in the circuit, the dropping of

the rheophore from the binding-post at the battery or from the electrode, or the moving of one of the switches of the battery. In a portable battery especial care must be taken lest disturbance be caused, the slightest jar of the battery causing undulations of the current and shock. At the point at which the stylet is inserted a grayish-yellow foam will accumulate, its mass depending upon the intensity and duration of the current."

"After the full intensity has been attained and continued as long as it seems necessary, the current is slowly reduced from cell to cell with the utmost evenness and gentleness, and the circuit opened when at 0. If the patient be very sensitive we may diminish the current by slowly increasing the resistance by the water-rheostat. When the current has been broken the rheophores are detached and the active interpelvic pole is first removed with the utmost caution; the abdominal plate is then taken off, the speculum inserted, and the vagina cleansed.

"I am in the habit of dusting the cervix with iodoform and inserting a tampon of salicylated or borated cotton; in case of puncture I use the styptic iron cotton directly upon the point of attack, and pack it firmly to counteract the possibility of hemorrhage as far as possible. The patient should then lie down or go to bed if at her home, and, if not, as soon as she reaches it; but in all events she must rest in the office long enough to thoroughly dry her garments, which are more or less moistened by contact with the electrodes notwithstanding all care; in cold weather this precaution must be invariably observed, as serious injury may follow neglect. Twenty-four hours' rest is generally all that is needed, but in individuals more susceptible it is well that they use the ice-bag upon the abdomen and remain in bed several days. The inflammatory swelling which sometimes follows is thus best counteracted and most rapidly reduced; but even when it does occur I have never seen it accompanied by constitutional disturbance or elevation of temperature.

"The puncture should, if possible, be made through the cervix into the mass of the tumor; if the first is above the os, the next should be below, followed by one to the right and then to the left; if this is not well feasible, we seek the point of greatest projection, toward the vagina, avoiding the peritoneum. In some cases a gush of blood, very profuse while it lasts, but not of long duration, may take place within the ten hours following the application, and the patient must be forewarned, that she may not be alarmed. The firmly-packed iron cotton tampon is the best preventive, but the hot-water injection should also be recommended, as the patient will be much better satisfied to have some means at hand to counteract this apparently threatening symptom."[1]

By this method Apostoli and Engelmann have treated a large num-

[1] "Electricity in Gynecology," by George J. Engelmann, *Transactions of the American Gynecological Society*, 1886.

ber of cases, and claim most excellent results. Although the tumor is not made to disappear, in nearly every case growth has been arrested, and in many instances the size of the tumor markedly diminished.

Chronic Cellulitis and Peritonitis.

In the treatment of the sequelæ of pelvic inflammation electricity is not infrequently followed by the most satisfactory results. The benefit, indeed, to be derived from this method of treatment in such conditions is only indifferently appreciated by gynecologists. For the absorption of old exudations in other parts of the body, the galvanic current has long been known to be most efficacious, but only within a comparatively recent period has it been tested in the thickening and infiltration resulting from inflammation of the pelvic cellular tissue. The negative pole, consisting of a metal ball or concave clasp, is to be used internally.

If the metal electrode is applied directly without the intervention of a sponge or chamois covering, care must be taken not to use currents sufficiently strong to produce eschars. This mishap may occur even without the knowledge of the patient, and it is therefore always safer to use a covered electrode. I have seen this treatment, judiciously and persistently carried out, melt away not only large pelvic deposits, but dissipate a most severe and persistent sciatica that had resisted every well-recognized method of treatment, and restore power to limbs wellnigh paralyzed. In these cases both sciatica and paralysis were occasioned by the pressure of the exuded material upon the pelvic floor, and could not have been relieved excepting through the disappearance of the morbid products. A current strength of twenty or thirty milliamperes is usually sufficient. Apostoli uses negative electropuncture in these cases, and very strong currents, from which he has seen only the very best results.

Hyperplasia Uteri.

The very disagreeable symptoms that are so often associated with this intractable condition are occasionally very much ameliorated by the persistent use of the galvanic current. The intra-uterine electrode may be used, but the current must be weak and the applications short, so as to avoid unpleasant electrolytic effects. As a rule, however, extra-uterine will accomplish quite as much as intra-uterine applications. The disadvantage of the applications by the former method, that it is not so direct, is more than balanced by the far greater tension of current that can be used when with a large sponge-covered bulb electrode firm pressure is made around and above the os uteri. In one case of hyperplasia uteri treated some months since the benefit accruing from persist-

ent extra-uterine applications was seen in a greatly increased menstrual flow and in the relief of severe gastralgia. But the most speedy and effective method of treating areolar hyperplasia is by electrolysis. One or two needles may be thrust into the hardened tissues parallel to the canal, and a current of from forty to sixty milliampères used. There can be but little question that the needles should by preference be connected with the negative pole, although Menière[1] claims to have treated one hundred cases, always using the positive as the active pole; but as he regards six months as the average time required for the treatment, it is evident that his results would be more speedy and satisfactory if he used the negative pole for its electrolytic action and the positive externally. It is seldom that the positive pole is indicated in electrolytic operations, unless the object is to decrease an active hemorrhage or to cause a blood-clot, as in the case of erectile tumors. The positive pole is more liable to cause a slough, and is far less efficient as an absorbent, than the negative.

Other conditions for which the galvanic current may be used with hopes of beneficial results are pachysalpingitis and lymphadenitis.[2] Apostoli has reported some cases of hæmatocele cured by this method.

Stenosis of the Uterine Canal.

In stenosis of the uterine canal the action of the galvanic current is most valuable, and in many cases is sufficient to afford complete relief. I have treated several of these cases by electro-cauterization, and in each instance with most satisfactory results. A sound of the proper size having been introduced, it is connected with the negative pole, the positive being applied to the abdomen. A strength of fifty milliampères, continued for five minutes, will, as a rule, be found sufficient. In my own cases the number of applications that were found necessary to effect a permanent cure ranged from six to twenty-five.

Extra-uterine Pregnancy.

My experience in the treatment of extra-uterine pregnancy has been given elsewhere,[3] hence it will be unnecessary to repeat in full detail here the various cases that serve to prove the feasibility of the operation as well as its great value. That the destruction of fœtal life could be easily affected by electricity admitted of no doubt, but whether it was possible to do this without in any way injuring the mother was a ques-

[1] *Gazette de Gynécologie*, Feb., 1886.

[2] Dr. Paul F. Mundé has reported in the *American Journal of Obstetrics* for Dec., 1885, some very interesting cases of this character treated by electricity.

[3] *A Practical Treatise on Medical and Surgical Electricity, etc.*, 4th ed.

tion that could be determined only by an experimental effort. This opportunity was afforded some years ago by a case in the practice of Dr. Charles McBurney, when the method was suggested by Dr. T. G. Thomas, and I was asked to superintend the operation. The case was one of tubo-interstitial pregnancy at the third month, and terminated favorably by the expulsion of the fœtus and placenta through the uterus. Subsequently, eleven other cases fell under my observation, all of which I submitted to similar treatment, and with results entirely satisfactory. The history of most of these cases will be found recorded in my fifth edition of Beard and Rockwell's *Medical and Surgical Electricity*. In one of these cases at least there was a subsequent conception, followed by a safe delivery of a healthy child. In these operations the galvanic current alone was used, the position of the poles varying according to the position of the fœtal mass, and the strength of the current according to the susceptibility of the patient and the probable distension of the Fallopian tube. As there is probably no remedy to the effects of which there are such different degrees of susceptibility, it is impossible to do more than approximately state the current-strength called for. In my own cases the current varied in strength from ten to twenty milliampères.

An interrupted rather than a continuous current is to be employed, although there may be an advantage in its rapid increase by means of a rheostat. In this way the chemical and physiological effects are greatly increased, without the disagreeable effects, and even the danger, that might accompany an interruption of the same strength of current. The danger to be apprehended from an injudicious application of the faradic or the interrupted galvanic current is the possibility of rupturing the over-distended tube. How great this danger is it is impossible to say, but that the possibility exists cannot be questioned. In one case, where the pregnancy had advanced nearly to the fourth month, the necessity for caution forcibly presented itself to me. By gradually increasing and as gradually decreasing the strength of the current I was enabled to use without fear a power of twenty milliampères where, with interruptions, I had feared to use more than five. In regard to the position of the poles, my custom has been to place the positive externally. This should consist of a broad, flat sponge pressed firmly on the skin and directly over that portion of the tube where the fœtus is developing. The negative pole is used internally, and may be carried up to the fœtal mass, either through the vagina or rectum according to the position and size of the tumor.

In the twelve cases that I have recorded the operation was performed through the vagina in nine and the rectum in three. As there seems to be no way of determining positively whether the fœtal life is immediately destroyed by the first application, it has been customary to repeat

it three or four times; and as but little pain is caused, there can be no special objection to its repetition on this score.

All medical and surgical procedures, however, that are not absolutely necessary are objectionable, and a remote possibility even of an accident of the kind to which reference has been made—viz. rupture of the tube—suggests that these applications be made no more frequently than will suffice to accomplish our object. I think it proper, therefore, to say that a strength of current just sufficient to destroy the fœtal life is it all probability capable of doing it at once, and that all subsequent efforts serve only the purpose of hastening the process of absorption.

Applications that are made solely for this purpose cannot be at all objectionable, as the galvanic current without interruption is the kind to be used. A most important point in the consideration of this operation is its simplicity as well as its certainty. I find the idea very widely prevailing that the operation is purely electrolytic, necessitating the introduction of needles into the fœtal nest. Happily, such is not the case, for any such procedure might itself be attended with danger, and certainly with considerable pain. The negative electrode consists of a metal ball, and is applied *to*, and not *into*, the tumor.

From its greater power of overcoming resistance, as well as other physical and physiological reasons, it will seem that galvanism ought to be preferable to other forms of electricity in this condition. Faradism has, however, been used with success, although in every one of my own cases galvanism has been the sole reliance. The galvanic current is more certain in its action and its effects are felt deeper, while its influence on the process of absorption is of course far greater than that of faradism.

In any case of tubal pregnancy—and especially in those advanced conditions where the tube is greatly distended and there is danger of spontaneous rupture—the possibility of hastening the catastrophe in the attempt to destroy the life of the fœtus should never be lost sight of. The tubes themselves are but slightly supplied with muscular fibre, and the danger would more especially arise from the powerful compression that is liable to be exerted by the abdominal muscles, and the effort should be so to diffuse the current proceeding from the external pole as to produce the least mechanical effect possible.

MENSTRUATION, AND ITS DISORDERS.

By W. GILL WYLIE, M. D.,
New York.

Menstruation, when normal, could be better described by a physiologist, but some knowledge of it is as essential to the gynecologist as the knowledge of the anatomy of the generative organs. We will not attempt to go fully into the physiology of the subject.

In healthy, well-developed women between the ages of fourteen and forty-four menstruation occurs once a month, except during pregnancy and lactation. It usually begins in temperate climates at the age of thirteen to fifteen, but in many instances much earlier, and often not till sixteen years or later. In warm climates it begins much earlier, and in cold climates later. It may be delayed by serious illness, such as anæmia, etc., or it may be hastened by an indoor and indolent life, and on this account it comes earlier in those brought up in large cities.

Just previous to the first menstruation a girl shows marked indication of rapid development. Her breasts enlarge, hair grows on the mons Veneris, her figure fills out, and her manner becomes shy and retiring. As a rule, menstruation is preceded by a feeling of weight in the pelvis and slight fulness of the breasts. Not infrequently there is some backache, but in many instances the first conscious indication is a flow of blood.

The time of the flow is from two to eight days. If less than two or more than eight, it usually indicates either local or general disease. The amount of flow is estimated to be from two to nine ounces. If less than five or six ordinary napkins or more than eighteen are pretty well saturated, then the amount may be considered abnormal. The periodicity is very variable: now and then we will meet a woman who menstruates on or about the same day of each month. More frequently it returns every twenty-eight days, but not infrequently it occurs every three weeks. In most cases it varies slightly. Usually for several hours it is slight in quantity, and may be light in color; on the second or third day it is usually at its height and the flow is dark, and unless very free it will not coagulate on account of admixture with the vaginal secretions. After the third or fourth day it ceases gradually.

Until Bischoff advanced and Pflüger elaborated and developed the theory of ovulation and ovarian irritation as the cause of menstruation, it was the belief that the menstrual blood was accumulated to supply the fœtus, and was thrown off as noxious material unless the woman became pregnant. For many years and until very recently ovulation has been considered the starting-point of menstruation, and Pflüger's theory has been the accepted doctrine. But lately, since menstruation has been found to continue with regularity in many cases after complete removal of both ovaries, other views are assuming more prominence. One of the most striking is that of Williams's desquamation theory, wherein he claims that the lining membrane down to the muscles is thrown off with each menstruation.

The writings and investigations by Kundrat and Engelmann attracted much attention. They claim that only the superficial layer undergoes degeneration and is thrown off. Instead of examining the uterus after death, Moricke curetted the uterus of living women during menstruation, and on examination of his scrapings claims that no part of the lining membrane is thrown off.

Leopold thinks that the bleeding is explained by the anatomical arrangement of the blood-vessels of the endometrium. He does show that the arterioles supplying the capillaries are relatively larger and more numerous than the veins that carry off the blood; and from this he claims that when there is a sudden afflux of blood to the uterus the capillaries will bleed, because they are subject to great pressure, as the veins cannot carry off the blood as fast as it is supplied. He denies that there is fatty degeneration of the superficial or any other layer, and says that the bleeding is due to rupture of the capillaries.

Lawson Tait now claims that it is not the ovaries, but the Fallopian tubes, that influence menstruation—that menstruation is induced by the active movements of the tubes to grasp the ovaries. But women sometimes menstruate regularly when both tubes and both ovaries have been removed. I know one who has missed not more than two menstruations in two years and a half, although I have both of her tubes and ovaries in a jar.

Lowenthal[1] has come out with a new theory—viz. "A Graafian follicle ruptures and liberates a mature ovum, which, having passed through the tube into the uterus, imbeds itself in the mucous membrane; its presence sets up hyperplasia and forms the menstrual decidua. If this ovum is impregnated, the menstrual decidua develops into the decidua of pregnancy; but if it is not fertilized, after a time it perishes, and by its death causes the disintegration of the menstrual decidua, and thus menstruation is induced." This may occur, but it

[1] *Archiv für Gynäk.*, Bd. xxiv. Hft. 2, and Bd. xxvi. Hft. 1.

does not explain menstruation when there are no ovaries to supply the ovum, as in those numerous cases where both tubes are occluded by imflammatory adhesions.

In the *American Journal of Obstetrics* (1885, vol. xviii. Nos. 2, 3, 4, 5, and 6) Dr. Mary Putnam-Jacobi elaborates the theory—"First, that the essential and efficient cause of the menstrual hemorrhage lies in the accumulation of blood in the periuterine and utero-ovarian sinuses. Second, that this accumulation does not constitute a congestion. . . . . But that the immediate cause of the determination of blood to the reproductive organs is the gradual enlargement by growth of the venous reservoirs destined to contain it." She explains the "mechanism by which the material for reproductive nutrition is evacuated." "When fecundation has not occurred, the growing endometrium, arrived at a certain point of development, is then arrested by the non-expansion of the uterine cavity. The opposing surfaces of the endometrium touch, press against each other; the vitality of the surface epithelium is impaired; it exfoliates, laying bare the surface capillary loops, which break at some point, so that capillary oozing begins," etc., etc. She also gives an explanation of the "mechanism by which hemorrhage is averted after fecundation," and explains "the individual variations in the subjective and objective phenomena of the menstrual cycle and of early pregnancy."

These views, as given by Dr. Jacobi, are exceedingly interesting and in many respects new, and many of the statements are so rational that they must be accepted; but the very completeness of it impresses one with the fact that as yet it is theoretical.

Although the generative organs are essential to reproduction, they are not essential to the individual and are not necessarily used. Disuse in organic life means in time atrophy and death. Therefore, menstruation may be intended to take the place of the free exercise of the functions of these organs, and thus compensate for the restraint and disuse so much and so necessarily practised by civilized races. It seems to regenerate a part at least of the uterus, and keep it in proper condition to receive and nourish the ovum when impregnated.

In treating uterine diseases it is important to recognize the fact that for several days before and during menstruation the uterus is somewhat enlarged, and the lining membrane of the uterus may be injured or menstruation disturbed by the use of sounds or any direct applications —that, as a rule, interuterine treatment or operative procedures should not be made for at least one week previous to menstruation, nor sooner than three or four days after it has ceased.

Disorders of menstruation cannot properly be classed as diseases, for any one of the disorders of menstruation may be one of the symptoms of several different diseases. On this account we cannot be expected to

go too much into details of treatment, etc., as much of it would be a repetition of that given by those writing on the different diseases.

Amenorrhœa.

The word "amenorrhœa" is used to indicate suppression or cessation of the menses between the age of puberty and the menopause. Although menstruation may occur during pregnancy or lactation without necessarily indicating serious disease, amenorrhœa must be considered normal during pregnancy and lactation, and before puberty and after forty years of age.

Amenorrhœa may be caused in two ways:

1st, it may be due to the debilitating influence of some constitutional disease or acute general disease.

2d, it may be due to local disease or to imperfect development of the generative organs, or to atrophy of one or more of these.

During the active stage of, and convalescence from, serious debilitating diseases, such as the essential fevers, phthisis, etc., amenorrhœa is to be expected and is desirable, and, instead of being an indication of local disease, shows that there is nothing about the generative organs which would induce hemorrhage, that might lessen the chance of the patient's recovery.

In chlorosis and anæmia amenorrhœa is especially desirable, and when menstruation exists with well-marked anæmia it indicates that there may be an abnormal state of the lining membrane of the uterus; and it may be as important to treat this condition, and thus induce amenorrhœa, as it would be to stop a very much more violent hemorrhage occurring in one whose general condition is good.

Five years ago a large, handsome woman, about forty-two years old, came to me for treatment. She had the characteristic skin of chronic anæmia, with puffed lower eyelids, swelling above clavicles, swollen feet, etc.; was always tired and much depressed. She had a dragging pain in her back, etc. On physical examination I found a large retroverted and retroflexed uterus. She said that she had been treated for two years by two of our most prominent specialists, who had used pessaries, iodine, hot water, etc. Her menstruation was pretty regular, and the amount lost was not more than a vigorous, healthy woman should lose; but I concluded that, taking into consideration her general condition, if the uterus was normal she should have amenorrhœa. I did not think the displacement alone accounted for the menstruation. I dilated the cervix, and with a Sims curette succeeded in removing about a tablespoonful of fungus granulations, and at once established amenorrhœa, and after a few months improved and finally cured her anæmia, and all indications of local disease disappeared. Since then I have

treated other cases of chlorosis by giving treatment to bring about amenorrhœa when the general health indicated it. When amenorrhœa is due to anæmia or any other disease, menstruation usually returns when the disease causing the debility is cured; but when the disease occurs during the period of development, say from ten to sixteen years of age, if the disease is prolonged and greatly reduces the vital force, development of the generative organs will be checked, and the final result may be a state of imperfect development of the generative organs, which not only unfits them for performing their functions normally, but renders them an easy prey to disease. Thus, amenorrhœa caused by general debility may exist after the patient's general health has been fully restored. When it does exist after the general health is restored, local treatment should be resorted to, to prevent further degeneration and atrophy, and if possible to stimulate the uterus and adnexa to complete development. When we find amenorrhœa in connection with a small, imperfectly developed hyperæsthetic uterus, or a small uterus associated with cystic degeneration of the ovaries or catarrhal disease of the Fallopian tubes, we must trace back the history with great care to be able to determine whether the imperfect development is due to congenital influences or to the direct influence of some debilitating disease, imperfect nutrition, or bad hygienic conditions acting during the period of development of the generative organs. Amenorrhœa may be caused by superinvolution of the uterus, or atrophy of the tubes and ovaries the result of extensive or destructive inflammatory local disease. During the acute stages of uterine and periuterine inflammation menstruation may be excessive, but when contraction of adhesions over the tubes and ovaries takes place, or when fatty degeneration and cystic degeneration take place in the uterine tissue, scanty menstruation is the rule, except when fungous granulations line the uterine canal.

It is a well-established fact that extreme mental emotion in many women, such as fright, anxiety, grief, etc., may for a time suppress menstruation. Women who for good reasons have great anxiety about the appearance of their menstruation may cause temporary suppression by the nervously anxious state they get into when it is due.

It would seem that some women are liable to acute catarrhal disease of the uterus in the same way as they are to catarrh of nose and throat, and exposure to cold near the time of the menses may cause suppression. But, as a rule, these are only temporary in their effect, and are not so serious as the amenorrhœa now so very common in young women who are urged on in intellectual studies, in addition to an indoor life and other bad hygienic influence, during the period of the active development of the generative organs. They thus acquire the habit of using up their vital force, so as to delay or render very imperfect the development of the generative organs. These organs are the

last to develop, and not being essential to life nor to mental or manual work, they are the first to fail. One of the first indications of this serious trouble is delay in the coming of the menses or suppression after having begun. In treating of Dysmenorrhœa I will refer again to this important subject, for I think that the imperfect development brought about in this way is the essential cause, not only of many cases of amenorrhœa and dysmenorrhœa, but also explains why so many apparently healthy women have uterine disease and why the cervix is so frequently torn, etc.

Great care must be taken to diagnose pregnancy as a cause of amenorrhœa, and where there is doubt time alone will enable one to be sure of a diagnosis.

With extra-uterine pregnancy amenorrhœa or scanty menstruation exists, and yet the uterus fails to enlarge as it would do in normal pregnancy. Great changes of the mode of living, such as a sea-voyage, may for a time cause amenorrhœa.

Scanty Menstruation.—Almost all that has been said about amenorrhœa may be said about scanty menstruation. Very much the same causes would induce it, and its treatment should be very similar.

Amenorrhœa may also be due to absence of the uterus or the ovaries and tubes when removed by operation or congenitally absent. In congenital absence of the vagina, or in complete occlusion or atresia of the cervix or vagina, the menses may be retained and cause the accumulation of a large amount of tarry mucus and blood in a pouch formed by the upper part of the vagina or the uterine cavity. These may be mistaken for amenorrhœa, but can hardly be classed as amenorrhœa. They would come under the head of imperfect development or disease of the cervix and vagina.

Treatment.—Since the old idea of the noxious influence of retained menstrual blood has been given up and the ovulation theory accepted, emmenagogues have not been very much used.

Practically, little good is done by the use of medicines in amenorrhœa, except as they may be made to improve the general health of the patient. Amenorrhœa brought about by debility due to general and not local disease does not require special treatment, unless the amenorrhœa continues for some time after the patient has fully recovered her general health.

In anæmic and chlorotic subjects iron in suitable forms will often cause menstruation to appear, but this may be by improving the condition of the blood rather than by specific action.

Aloes in cases of suppression of the menses, if used at or near the time that menstruation is due, may bring it on, but it probably acts by irritating the intestines and thus causing pelvic congestion, and not by

any specific action. Other medicines, such as potassium permanganate, binoxide of manganese, oil of savine, mustard, etc., are used as emmenagogues, but their usefulness is very doubtful.

The application of heat by means of hot baths to the feet or hips may be safely used, but except where menstruation is about due they are not to be relied upon.

Local treatment is chiefly useful in cases of imperfect development, especially where amenorrhœa occurs during the period of development.

At the same time that an effort is being made to improve the general health of the patient stimulating applications may be made to the uterus and the vagina. Hot-water vaginal douches of half a gallon, given at 105° to 115° F., with the patient lying on her back, are sometimes efficient, and can always safely be made supplemental to more active local treatment.

As a stimulating and safe application to improve the local circulation of the pelvis I prefer a solution of one part of boro-glyceride, one of alum, and fourteen of pure glycerin, to be applied to the vagina by means of firm rolls of absorbent cotton from one and a half to two inches long and from one-half to one inch thick, tied with a string at one end to facilitate removal, thoroughly saturated with the solution, and applied twice a week, each application remaining twenty-four or forty-eight hours. This application causes a profuse watery flow, and keeps up a very active pelvic circulation, and after a few weeks' use improves the local condition and stimulates development. If there are catarrhal disease and more or less contraction and atrophy of the endometrium associated with amenorrhœa, after the above applications have softened the parts and rendered the uterus freely movable the cervix should be dilated and stimulating interuterine applications made.

Electricity regularly applied to the cavity of the uterus and over the ovaries seems to stimulate development in some cases.

In those cases of suppression where ten or twenty years ago leeches to the cervix, bleeding from the arm, and emmenagogues were given, I usually give a free laxative and apply the boro-glyceride and alum-and-glycerin pledgets, and order hot-water douches and baths, and an anodyne if needed. In a few days both the general and the local congestion are relieved.

In cases of amenorrhœa where there are symptoms of pregnancy or reasons to suspect it, no interuterine examinations or active treatment should be given, as a matter of course, but simple laxatives and the cotton pledgets saturated with boro-glyceride and alum-and-glycerin mixture to relieve congestion will do no harm. They soften the parts and enable one to make a more certain diagnosis.

Vicarious Menstruation.

Vicarious menstruation may occur in connection with amenorrhœa or scanty menstruation. Well-marked cases are rare. Its significance is not of great importance. It indicates a watery and poor condition of the blood, usually associated with a constitutional tendency to bleed, due in some cases to a faulty state of the blood-vessels. The blood may come from the throat, nose, gums, breasts, or an open sore or wound, and it may show itself with regularity at the time of the menses or when the circulation is disturbed on account of the menses being suppressed. I have seen it to a slight extent occur in a woman in whom at the autopsy not even a sign of the uterus or vagina could be found, although two ovaries were found—one in the canal of the round ligament of the right side, the other near the hilus of the left and only kidney.

I now have under treatment a patient with occlusion of the vagina who regularly each month has nose-bleed. An anæmic woman under my care, the mother of six children, when pregnant with her seventh child menstruated with perfect regularity from the bladder for eight months. Except a slight catarrh of the bladder that had existed previously, and now exists eighteen months after the birth of the child, no other disease has been made out. After the birth of the child she had amenorrhœa for sixteen months. The flow from the bladder was dark in color and quite free, and lasted five or six days.

Unless the hemorrhage is such as to cause trouble from the amount of blood lost, special treatment is not usually indicated. Cure the cause of the amenorrhœa, and in most cases the vicarious menstruation will cease.

Menorrhagia and Metrorrhagia.

The term "menorrhagia" is used to indicate excessive or prolonged menstrual flow, while "metrorrhagia" is uterine hemorrhage occurring independently of the menses. It must not be forgotten that the amount of blood lost by different women at menstruation varies very greatly, and the length of normal flow and intervals between the menses also varies greatly. The best indication of its being abnormal is either a sudden change in the usual length of time or quantity of flow, and its influence on the general health of the patient.

Menorrhagia, and especially metrorrhagia, as a rule, indicate local disease or a change in the tissues of the lining membrane of the uterus the result of disease. In diseases such as scorbutis, chlorosis, and in some women variola, rubeola, typhus fever, malaria, etc., where the blood is changed in character, there will be an increase in the amount, and especially in lengthening of the time, of the menstrual flow. As

has already been pointed out, amenorrhœa is the rule under such conditions of the blood, and a careful investigation will often disclose a local state of the lining membrane, such as fungous granulations, which will account not only for the menorrhagia, but for the existence of menstruation at all under such conditions; and when the local disease is removed it will be easier to cure the disease affecting the general health. Sometimes menorrhagia seems to be due to disturbances of the general circulation, such as is caused by stenosis or insufficiency of the mitral valves, emphysema, the pressure of a large tumor, or the use of active vascular stimulants, such as quinine, etc. This influence, of course, would be more likely to affect a uterus that is not in a perfectly normal state, and we can often prevent injurious effects by correcting whatever local disease or abnormal condition may be found.

Therefore, we must come to the conclusion that bad conditions of the blood and disturbances to the general circulation seldom cause menorrhagia as long as the generative organs are normal, and very rarely could induce metrorrhagia, except when acting on an abnormal or diseased local condition. Local conditions that cause menorrhagia and metrorrhagia may be divided into two classes—those due to abnormal conditions of the adnexa and periuterine tissues, and those due directly to abnormal conditions or disease of the tissues of the uterus. The latter is by far the more important of the two, and when uterine hemorrhage becomes greatly prolonged or recurs persistently it will usually be found that fungous granulation or some such change in the lining membrane has taken place. In acute inflammation of the periuterine tissues caused by salpingitis, ovaritis, etc. there may be either menorrhagia or metrorrhagia; but this local flow often gives relief to the pain, and unless excessive—as it seems to us favorable to the progress of the periuterine disease—it is best not to check it. This flow, which so frequently occurs during an *acute* attack of local peritonitis, will not recur with the next menstruation, and by waiting long enough a differential diagnosis can easily be made. Unless the hemorrhage be very profuse, it is usually better to wait until it has recurred once or twice before resorting to curetting.

Myomatous fibroma and other tumors of the uterus rarely cause hemorrhage unless they are so situated as to increase or change the vascular condition of the lining membrane of the body of the uterus. It is not uncommon to find enormous subperitoneal fibromata attached to a small uterus which does not bleed excessively at any time. Even very vascular myomata may be attached at or below the vaginal junction and lift the uterus to the ensiform cartilage, and yet not cause menorrhagia. I operated on such a case not long since, and a few months ago I removed a fibroma the size of the head of a five-year-old child, distending the cavity of the cervix, which had elevated the

small and firm body of the uterus to the umbilicus, and yet there never had been either menorrhagia or metrorrhagia, nor dysmenorrhœa. For some years past, instead of resorting to Hager's operation for removal of the ovaries or performing hysterectomy for uterine hemorrhage, I have first tried the effect of curetting the cavity of the uterus. The results have been so satisfactory and lasting that I have lost the chance of performing laparotomy in a large number of cases. And I can say the same in regard to those cases where the hemorrhage appears to be due to ovaritis. I would always use the curette in such cases, even though the evidence of granulations were never so slight, before resorting to laparotomy for uterine hemorrhage. Acute inflammation of the uterus may cause suppression of the menstruation, and usually results in irregular menstruation; but when, as it often is, associated with subinvolution after labor, and especially after abortions, fungous granulations form, and in many cause menorrhagia. Some such changes in the vascular condition of the lining membrane of the body of the uterus will be found in the vast majority of instances to be the immediate cause of both menorrhagia and metrorrhagia, of course excluding cancer, sarcoma, large polypi, etc. Subinvolution, follicular and glandular disease of the cervix associated with laceration, displacements, etc., may be called the primary cause; but the cases of menorrhagia and metrorrhagia associated with or following these conditions are very rare that do not cease after proper preparatory treatment and curetting.

Cancer in women over thirty-five years of age is the most frequent cause of metrorrhagia, and on account of the importance of recognizing this disease in its earlier stages it is the duty of a doctor to insist upon a local examination, as being the only certain means of making a diagnosis.

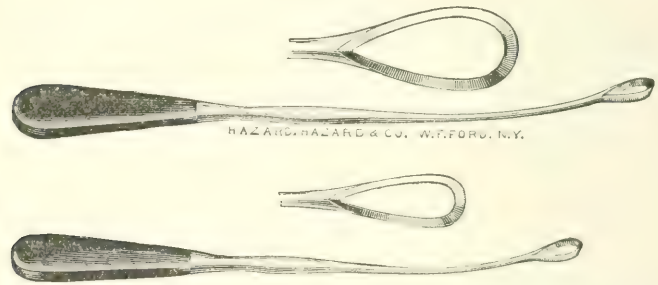
The menopause has been commonly credited with causing both menorrhagia and metrorrhagia, both by doctors and patients, but I have rarely seen a well-marked case occurring at that time without its being due to some well-defined uterine disease, most frequently directly caused by either fungous granulations or cancerous disease. If physicians could be generally impressed with these facts, we would not so frequently see cancer of the cervix advanced to a hopeless stage before an examination is deemed necessary, on account of the erroneous belief that irregular uterine hemorrhage is normal at the menopause. Retained membranes after labor and abortions not only may induce puerperal hemorrhage, but may in time cause morbid growths, such as fungous granulations, and thus induce menorrhagia. We will not attempt to speak more explicitly of hemorrhage due to this cause.

Treatment.—In describing the causes of menorrhagia and metrorrhagia the treatment has been indicated, and we will now speak chiefly

of the special treatment, and more particularly of the two principal local means of correcting uterine hemorrhage.

Hæmostatics acting through the general system on the uterus are sometimes useful in decreasing the flow, but are rarely curative in their action. Ergot, when the uterus is enlarged, will cause uterine contractions, but it cannot be relied upon to control menorrhagia or metrorrhagia. A fresh preparation of cannabis indica, given in pretty full doses twice a day, will in many cases control or lessen the flow in menorrhagia. Complete rest in bed also diminishes the flow. But to cure menorrhagia or metrorrhagia local treatment must be given in the great majority of cases. The tampon as generally used does more harm than good. In the first place, unless it is properly applied by an expert it rarely stops hemorrhage of consequence, and usually merely conceals it for a time; secondly, in using a tampon, and leaving it in place longer than is necessary to cause a clot to form, we violate one of the most important laws of good surgery—namely, obstructing free drainage. We also run the risk of forcing irritating and perhaps septic

FIG. 173.



Sims's Curette. There are three sizes. It is made of steel, with edges sharp enough to scrape, but not sharp enough to cut with.

material from the uterine cavity into and through the Fallopian tubes into the peritoneum. The same objections hold good against the use of tents, especially sponge tents. When a tampon is to be used the cotton pads should be squeezed out in a solution of bichloride, 1 to 5000, and well sprinkled with iodoform before being inserted. A good pair of Sims's uterine dilators, when properly handled, soon enable one to dilate the cervix uteri, and when a piece of retained placenta or fungous granulations are effectually removed by means of a Sims curette, any bleeding that may follow can, as a rule, be controlled by the use of hot water at a temperature of 120° F., followed by ice-water, either injected or quickly applied by small sponges on sponge-holders.

It is better to keep the patient on the table for half an hour or longer after curetting, so as to prevent hemorrhage, than to insert a

tampon for the purpose. The gynecologist who cannot use Sims's steel curette without seriously injuring the uterus is not skilful enough to use any curette. By cleanliness and the use of antiseptics the only real danger in its use—namely, septic poisoning—is reduced to a minimum.

Even in severe uterine hemorrhage after abortion it is best to at once dilate the cervix with a dilator, and remove with the curette any retained membrane, and avoid the use of either sponge or other tents or tampons.

Dysmenorrhœa.

The term "dysmenorrhœa" is generally used as meaning painful menstruation, but others define it so as to include pain just before, during, and just after menstruation.

There is but little doubt that for at least one week before the menstrual flow shows itself there is an increase in the amount of blood in the pelvis, and there is good reason to think that this increase of vascular tension in and about the uterus gradually grows greater up to the time that menstruation begins. Now, if we are to include all the disturbance and pain caused by this gradual distension of the pelvic vessels, and the pain that occurs with the flow and that which sometimes occurs when the flow is more or less suppressed, in our description of dysmenorrhœa, there would be little to distinguish it from the pain of pelvic peritonitis, ovaritis, etc. It seems to me that it is best to limit the use of the word "dysmenorrhœa" to describe the difficulty caused by the flow from the time it begins in the uterus—which may be hours before it shows itself at the vulva—until it ceases. To get a clear conception of dysmenorrhœa it is important to recognize the fact that we frequently see cases where severe pelvic pains, especially pain over one or both ovaries, that has gradually grown worse for several days previous to menstruation, subside as the flow begins, and disappear when it is well established. It is plain that the flow relieves the vascular tension, and thus lessens the pressure on the sensitive ovaries, tubes, or periuterine tissue; yet many authors describe fully what they call "ovarian dysmenorrhœa."

Ovarian disease often complicates menstruation, and when menstruation is difficult and creates such an irritation as to increase for the time the actual amount of blood in the pelvis, instead of lessening it, the ovarian pain may be intensified; but I am inclined to doubt if ovarian disease ever directly causes painful menstruation. Certain diseases of the ovaries may bring about structural changes in the uterus, and dysmenorrhœa be the result, but the immediate cause of the dysmenorrhœa is in the uterus. Ovulation occurring in a diseased ovary or in one encased in inflammatory adhesions may take place at the same time with the menstrual flow, and thus cause pain; but unless it can be

shown that the menstrual flow causes ovulation this pain cannot be fairly termed dysmenorrhœa. There is some reason to think that the Fallopian tubes may be active at or about the time of menstruation. In removing the appendages for disease I have several times found the fimbriæ spread out over the surface of the ovary, just as the fingers would be when one picks up a large ball, and firmly fixed by adhesions. Now, under what conditions this takes place I do not know, and we do not yet know what the normal action of the tubes is during menstruation, but I am certain that we often find marked disease of the tubes and ovaries fixed by adhesions in women who do not have dysmenorrhœa; on the contrary, they feel better at that time than at others. In quite a number of cases I have succeeded in curing the dysmenorrhœa that complicated salpingitis by dilating and treating the uterine canal before operating for removal of the tubes and ovaries. In three well-marked cases I failed to cure the dysmenorrhœa because the treatment caused fresh pelvic peritonitis and cut short the interuterine treatment; but this was not an unlooked-for result, although long preparatory treatment was given in each case to render the uterus movable and lessen the chance of disturbing the periuterine tissues. After three years' close observation of many cases, during which time I have removed the tubes and ovaries for disease thirty-seven times, I have come to the conclusion that the change that takes place in the pelvic tissues for some days previous to menstruation often causes increased pain in diseased tubes and ovaries, but that, except in those cases where other causes for dysmenorrhœa exist, the menstrual flow actually gives relief, especially if the patient is in bed. It is true that in well-marked cases of disease of the uterine appendages the patient may suffer from dysmenorrhœa, but a careful investigation of these cases will in most instances disclose abnormal conditions about the uterus that will account for the dysmenorrhœa.

Just before and during menstruation women with periuterine disease may have increased pelvic pains when up and about, and especially when standing, but these are due to the influence of gravity causing pelvic congestion, and not to the flow.

Disease of the uterine appendages undoubtedly often complicates, and is frequently associated with, dysmenorrhœa, and certain destructive diseases of the ovaries and tubes may in time cause structural changes in the uterus that may result in dysmenorrhœa; but I doubt if dysmenorrhœa, properly speaking, can be called ovarian dysmenorrhœa.

Most of the attacks of pelvic peritonitis so common in, and so characteristic of, salpingitis occur at or about the time of menstruation, and very frequently complicate dysmenorrhœa. Hemorrhages may form hæmatoceles, serous effusion due to local peritonitis take place, and other causes of pain may complicate menstruation, but these are

not due to the menstrual flow: they may be caused by the changes outside of the uterus which terminate in menstruation.

Etiology.—The flow of menstruation is caused by changes that take place in the lining membrane of the uterus, and when pain results from this flow its cause is to be found in the tissues irritated by or pressed upon by the flow.

Excluding those rare cases where there is disease or occlusion or complete atresia of the vagina or an imperforate hymen that may cause pain by obstructing the flow, there are only the endometrium and the underlying uterine walls in which to examine for obstruction to the flow. When the flow is obstructed it may accumulate in the uterus, distend the cavity, and press upon the lining membrane or muscular wall, and thus cause pain, especially if these are diseased; or when obstructed it may accumulate in the periuterine tissues, abnormally distend the blood-vessels, and thus cause pain, especially in diseased periuterine tissues or organs; or it may be driven into and through the tubes, especially if diseased, and irritate the tissues of the tubes or peritoneum, and thus cause pain; but in all of these the obstruction is the essential, and therefore the real, cause of the dysmenorrhœa.

We know that many tissues when normal are not painful when pressed upon, but that when diseased or when they have been changed by disease, especially by what we term inflammatory disease, these same tissues become exquisitely sensitive to very slight pressure, and often become incapable of performing their normal functions without creating pain located in themselves or by what we call reflex action in some other tissue or organ.

If we knew definitely the physiological processes of normal menstruation, we could soon determine the true pathology of dysmenorrhœa; but since our knowledge is so slight and the views of the best investigators are so conflicting, we are obliged to rely upon clinical experience to guide us. My experience has led me to some very definite conclusions about the cause of dysmenorrhœa. In the majority of instances I think it is caused by a hyperæsthetic condition of the endometrium, especially at or near the os internum, often combined with more or less stenosis or induration at this point—stenosis due to degeneration, contraction and atrophy, the result of imperfect development followed by disease, or disease followed by induration, atrophy, and contraction. These same conditions, in all probability, render abnormal the processes that take place in the endometrium previous to and during the flow—may cause it to disintegrate and exfoliate in pieces, and add to the pressure of the blood or cause spasmodic muscular contractions, etc. The hyperæsthesia may induce spasmodic uterine contraction, which may cause the pain without the presence of any special induration or stenosis at or about the os internum.

Take a well-marked case of dysmenorrhœa, and pass a large sound, yet one that may be passed into a normal uterus without causing pain as it passes the os internum: it causes a severe aching pain, and frequently the patient will voluntarily exclaim that it causes the same pain as menstruation. Even in those who have only slight dysmenorrhœa very little pressure with the blades of a uterine dilator will cause the characteristic pain.

It only causes confusion to classify dysmenorrhœa as neuralgic, ovarian, obstructive, etc. Clinically, it cannot be done. It is true that ovarian and other diseased tissues about the pelvis become more painful on account of the vascular tension in the pelvis before and until menstruation is well established; but unless there are abnormal changes in the lining membrane or decided obstruction to the flow menstruation will relieve the pain caused by congestion in the periuterine tissues. In acute inflammation or disease of the uterus itself, unless the flow is retarded by pressure of the swelling, menstruation lessens the pain, and the pain varies inversely with the amount of the flow.

The hyperæsthetic and indurated state of the tissues so characteristic of typical cases of dysmenorrhœa appears to be an abnormal condition, the result of imperfect development and atrophy, or disease followed by atrophy, rather than the existence of an acute disease. I have never been able to determine whether fissures about the os internum may not sometimes cause the hyperæsthesia and dysmenorrhœa.

Many of the worst cases of dysmenorrhœa occur in young women during the period of development, without their ever having had any symptoms of local disease, unless the slight leucorrhœa which may be present at times be so considered. This leucorrhœa would not be a symptom of anything more than a subacute catarrhal condition of the endometrium, which would be likely to occur in imperfectly developed and atrophying tissues; nor would we expect imperfectly developed and atrophying tissues to either resist disease or go through an elaborate change every month normally. Therefore, anything which arrests or renders imperfect the development of the generative organs may indirectly cause dysmenorrhœa; or any disease of these organs that results in degeneration and local atrophy may cause dysmenorrhœa.

Dysmenorrhœa is very frequently associated with a bad condition of the nervous system—a "neuralgic diathesis," if you wish to call it so; but this is no certain indication that the neuralgic diathesis causes the dysmenorrhœa. It is more than likely that both are the result of some constitutional disease or of imperfect nutrition.

Cystic degeneration of the ovaries is often associated with dysmenorrhœa, and it is more than likely that a disease of the ovaries resulting in degeneration and atrophy may thus cause the conditions in the uterus which induce dysmenorrhœa; but the natural result of atrophied

ovaries, as a rule, is amenorrhœa. In most cases it is probable that the same influences which cause cystic degeneration and atrophy of the ovaries render imperfect the development of the uterus; and this results in atrophy, contraction, and hyperæsthesia which causes the dysmenorrhœa.

In nulliparous women characteristic cases of dysmenorrhœa are nearly always associated with decided anteflexion, but it has never been satisfactorily proven that the flexion is ever the cause of the dysmenorrhœa. That a man feeble from sickness bends over when he walks does not prove that the pain he may endure or his loss of strength is due to the flexion of his spine.

Years ago I abandoned the prevailing belief that anteflexion frequently causes dysmenorrhœa directly by mechanically closing the canal. When the flexion is extreme it may to some extent obstruct a free flow from the uterus, but unless there is associated with the flexion a hyperæsthetic state of the lining membrane, and this, as it nearly always is, complicated by contraction or inability to expand, there will be no dysmenorrhœa. Dilate the cervix and cure the hyperæsthesia, and the dysmenorrhœa disappears, although the flexion remains. It may be said that when you dilate the cervix you straighten the uterus, and it is this that cures the dysmenorrhœa; but the answer to this is that until the uterus begins to develop strength under the stimulating influence of treatment the uterus bends on itself as soon as the dilators are removed, although one or two effectual dilatations may completely relieve all pain at menstruation. Besides, when a stem pessary is used and dysmenorrhœa is relieved by it, the uterus is not only straightened, but the cervix is dilated and a decided change brought about in the lining membrane by the presence of the pessary in the uterus.

The use of vaginal anteflexion pessaries may palliate some of the symptoms associated with dysmenorrhœa, but unless the hot-water douches used to keep the pessaries clean, or the laxative and tonics given to improve the general health usually prescribed with the use of the pessary, stimulate development, the pessary will have but little influence on the dysmenorrhœa associated with the flexion.

Extreme retroflexion when the uterus is forced down against the sacrum between the utero-sacral ligaments may, by interfering with the uterine circulation, obstruct the flow and cause pain with menstruation. Extreme stenosis of the os externum may obstruct the flow and cause dysmenorrhœa. This may be due to congenital influences or be the result of disease, or be due to cicatrization from the use of caustics, galvano-cauteries, etc.

If we are right when we say that dysmenorrhœa is chiefly due to a hyperæsthetic condition of the membrane lining the body of the uterus,

associated with a contracted or inelastic and irritable state of the tissues at or about the os internum, and that in most cases this condition is brought about by incomplete or arrested development of the generative organs, followed by atrophy or by degeneration the effect of local disease that results in degeneration and atrophy, not only are the indications for treatment of dysmenorrhœa made plain, but also the very great importance of preventing the further advance of the serious condition connected with it, of which the dysmenorrhœa is one of the first undoubted symptoms.

It is a well-recognized fact that dysmenorrhœa is much more common among highly-educated and well-to-do classes than among the laboring classes. This is probably due to two causes: 1st. Among the rich the law of survival of the fittest is interfered with; that is, among the poor the feeble and sickly children die in infancy or early youth, while many children of the rich with inherited tendencies to disease are by the better care that they receive enabled to reach puberty. 2d. As the children of the rich approach puberty the girls are kept indoors, deprived of fresh air and sunlight, and by custom compelled to lead physically passive and indolent lives as compared with the poor or working class. Besides being enfeebled by bad hygienic environments, they are compelled to expend all available force in intellectual work at a time when the generative organs should be developed. Even where a good constitution is inherited, and sufficient food, exercise, and sunlight are allowed to fairly well develop the muscular system, if emotional and intellectual work is forced upon them during the period that the generative organs should be developed or allowed force to develop, they will be likely to suffer from dysmenorrhœa due to imperfect development of the generative organs. Numerous examples of this class can be found among the scholars of our normal schools, for it is here that the brightest graduates of our high schools go, their successes, prizes, etc. being additional incentives to keep up the intellectual strain, and thereby longer delay the full development of the generative organs. In this country intellectual education is more general among women than in any other, and the influence of imperfectly developed uteri in causing laceration of the cervix, etc. may partly explain why so many women, comparatively speaking, seem to suffer with uterine disease.

The generative organs are not essential to the life of the individual, and, being last to develop, naturally may be the first to suffer if the vital forces are insufficient or if they are forcibly absorbed by brain-work. It would seem that a certain amount of surplus of strength and force is requisite for the perfect development of the generative organs. If women are to avoid diseases of the generative organs and are to bear children, their vital forces should not be exhausted nor forcibly diverted by emotional or intellectual work during the period

that they are changing from girlhood to womanhood. During the period of development, from ten to seventeen years of age, good food, free open-air exercise, and sunlight are especially needed, and freedom from emotional excitement, care, and anxiety is desirable; and all intellectual effort that is laborious or absorbing should and can be deferred until full development of the generative organs has been secured.

To prevent the effects of either general or local disease resulting in dysmenorrhœa it is important not only to cure the disease, but also to not too long delay giving stimulating local treatment when indicated by the continuance of amenorrhœa, in order to prevent degeneration and atrophy.

TREATMENT.—To relieve the pain caused by disease of the tubes, ovaries, or periuterine tissues, so far as menstruation influences it, the best thing to do is to increase the flow rather than stop it. Opium not only dulls the pain, but at the same time seems to relax the local congestion, and thus increases or equalizes the flow. Its influence in this respect on the congestion due to acute local inflammation of the uterus itself is still more marked. Local treatment to the uterine cavity should not be undertaken in these complicated cases until they have been rendered subacute and the uterus made movable by the prolonged use of simple vaginal application, which will improve the circulation of the pelvis, and thus cause the absorption of most of the products of inflammation and render pliable the peritoneal adhesion that may be present. When the uterine sound is used, it will show in well-marked cases of dysmenorrhœa associated with ovarian disease that a hyperæsthetic and more or less inelastic, if not contracted, condition of the endometrium has been the real cause of the dysmenorrhœa.

I have had very little satisfaction in the use of medicine in curing dysmenorrhœa by any specific action, and I only use anodynes as palliatives in case of severe pain until the dysmenorrhœa is stopped by improving the general health or by local treatment.

To illustrate what I consider to be the best plan of treating typical cases of dysmenorrhœa, I will describe the different steps that I am in the habit of pursuing in my private practice.

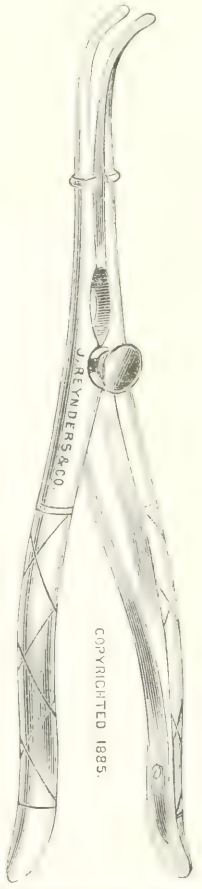
A young woman, say of seventeen years, is brought to me by her mother. After taking a careful history of the case, inquiring especially as to any disease or sickness that she may have had since nine years of age, and as to her mode of life and studies during that time, I do not at first advise a local examination, but make sufficient examination to detect any signs of a complicating or constitutional disease. If she is inclined to constipation, I order either pulv. glycerrhiz. co. to be taken at bedtime, or fl. ext. cascara before meals. I prefer these preparations, for I know that they may be used without necessarily fostering the fixed

habit of using laxatives. If she is anæmic I order Blaud's pills, one after each meal, as being one of the best forms in which to give iron. If she complains of being tired and wakeful or nervous, I order a tablespoonful of the syrup of the hypophosphites, to be taken after meals. If her appetite is poor or there are more marked evidences of faulty assimilation, I order a glass of pancreatized milk with each meal, or a bottle of Brush's koumyss twice a day. If she is at school she is ordered to give it up and to spend much of her time in the open air, and to come in contact with healthful, agreeable people whose presence does not excite or exhaust her. This plan of general treatment will often give relief in a few months, and if persevered in will in simple cases effect a cure without any local treatment, which on account of its disturbing and trying effect on sensitive girls is to be avoided if possible. If the above fails after a fair trial, then I order in addition that hot vaginal douches be properly given for ten days previous to each menstruation. If this does not steadily improve the condition of the patient and lessen the dysmenorrhœa, I then advise a local examination. In cases of long standing the ostium vaginæ may be found extremely sensitive and abnormally contracted—in fact, in a state probably not unlike that of the endometrium. In these, on account of the hyperæsthesia, etherization may be required to obtain even a simple examination with the index finger. While the patient is under ether it is well to thoroughly dilate the vagina, so as to lessen the pain of subsequent treatment.

After ascertaining the condition of the uterus and other organs as far as practicable, I at once begin treatment by the application of pledgets of cotton saturated with a mixture of pure glycerin and boro-glyceride: the latter is an antiseptic and prevents fermentation, etc. that may follow the use of simple glycerin. The applications are made to the vagina twice a week, kept in for twenty-four hours, and vaginal douches given when removed. They will cause a free watery vaginal discharge, and after two or three weeks will soften and render less sensitive the vagina and enable you to freely move the uterus. In well-marked cases of dysmenorrhœa the uterus will be found abnormally small, the cervix pointed and hard, with its axis parallel with that of the vagina, the intravaginal anterior lip being very short and the posterior long; and the fundus will usually be flexed forward. If the patient gives a history of habitual constipation, the left broad ligament will give evidence of having been stretched, and the left ovary will be found prolapsed to the level of the vaginal junction, and the broad ligament feel full and elastic on account of the varicosed state of the pampiniform plexus—a condition similar to varicocele in the male. There may be a leucorrhœal discharge, with a slight granular eroded condition of the endometrium in and around the os externum. After rendering the uterus movable by this preparatory treatment, and having ascertained the

absence of any complicating periuterine inflammation, the vagina is swabbed out with a sol. bichlor. mer., 1 to 3000, and then a clean sound is passed for the first time. As a rule, it should be curved to suit the degree of flexion. As it reaches and passes the os internum the patient will complain of the same pain as that caused by menstruation, and as the sound is withdrawn a little blood may show itself at the os externum. Having had the case under preparatory treatment long enough to be sure of a correct diagnosis, and having rendered the uterus movable, and feeling satisfied that there is no periuterine disease, such as a distended tube to be ruptured during the act of dilating the cervix, the case may be considered ready for the next step in the treatment—namely, dilatation. But if the case is complicated by periuterine congestion or "subacute inflammation," the simple glycerin pledgets are replaced by similar pledgets saturated with a mixture of alum one part to pure glycerin fifteen parts and one part of boro-glyceride. The size of the pledgets is gradually increased. As a rule, an ordinary case will be much changed in two or three weeks by this preparatory treatment; the vagina is less sensitive and larger; the cervix is less pointed and its axis directed farther backward; the periuterine tissues are softened and less painful upon examination. Occasionally a case of long standing, in which the nervous system has been seriously affected, will require six or eight weeks of such treatment before the next step can be safely undertaken.

FIG. 174.

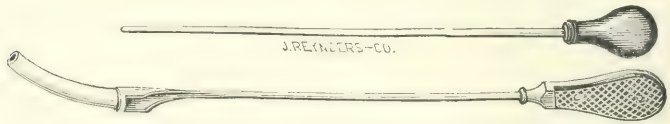


Modified Sims Dilator, made of steel so tempered that the blades will remain parallel under 500 pounds of pressure.

Dilatation.—The patient being in Sims's position, the vagina is sponged out with a solution of 1 to 3000 bichloride or 1 to 20 of carbolic acid. All instruments are kept in a solution of carbolic acid. Then a Sims uterine dilator is inserted in the uterine canal. By allowing the instrument to ascend with the uterus to the vault of the vagina and carefully watching the amount of separation of the blades, there will be no danger of the dilators slipping and the degree of dilatation can be readily regulated. The dilator, when properly curved, can be passed almost as easily as a curved sound; the blades should be forced apart about four lines. The amount of force required for this dilatation will, of course, vary greatly, but usually in old cases it is considerable, especially those of the imperfectly developed type. This procedure causes more or less

(and in some cases intense) pain, similar to that due to menstruation. The dilator is withdrawn and the cervical protector introduced into the os internum. An applicator previously wrapped with cotton is dipped into pure carbolic acid; the free acid having been rubbed off, it is passed through the tube of the cervical protector directly through the os internum, and thoroughly applied by turning it about and slightly withdrawing the tube and applicator. About twenty grains of iodoform are blown against the cervix as the speculum is withdrawn. In some cases the pain is immediately relieved; rarely the patient complains of cramping pain for several hours. When properly performed as directed above, and if antiseptic precautions were used, I have never seen any harm from this treatment in uncomplicated cases. The first dilatation can be made at the patient's home, and she is kept in bed for the rest of the day or until all disturbance has ceased. As a rule, it is best to allow at least a week to pass before the dilatation

FIG. 175.



Wylie's Cervical Protector, made and used fourteen years ago: three sizes.

is repeated. The glycerin pledgets can be inserted as usual. Sometimes I repeat the dilatation three times between the menses, but usually twice is sufficient; and if the dilatation can be carried to the point where the blades are four lines apart at the os externum, the dysmenorrhœa is relieved in the majority of cases where there is no active endometritis or endocervicitis, and in favorable cases it is the beginning of a permanent cure. Much will depend upon the condition of the general health and on the readiness with which the lining membranes of the uterine canal respond to the treatment. Where the tissues are not sensitive and the uterus is small and atrophied, I use iodine in place of carbolic acid, or I apply electricity directly to the uterine tissues and persist in the treatment until the uterus develops.

Besides the vaginal and periuterine hyperæsthesia, any complication, such as vaginitis, acute endocervicitis, metritis, or local peritonitis, should be treated before resorting to dilatation for the removal of dysmenorrhœa. In those cases where catarrhal disease and anæmia are active agents in causing the disease or hyperæsthesia at the os internum, the dysmenorrhœa will of course be likely to return, unless these conditions are permanently corrected. The changes produced by this treatment are—a shortening of the cervix, a nearer approach to the normal direction of the axis and shape of the vaginal cervix, and a complete alteration in the mucous lining. Any subacute congestion

with faulty secretions is usually cured, the secretions of the cervix becoming transparent like the white of an egg. After this treatment a sound can be passed to the fundus without causing pain. This simple method of dilating and the use of the cervical protector enable one to make effectual application to the lining membrane of the uterus. Without dilatation applications to the endometrium are out of the question, and without the cervical protector most of the solution would be absorbed or rubbed or squeezed off by the walls of the cervix.

Divulsion.—In married women, if nothing is done to prevent impregnation, sterility will often be cured by this simple dilatation. But in a certain number of cases this method gives only temporary relief. The vaginal part of the cervix is abnormally long and pointed and hard, and does not shorten up after dilatation, and the stenosis is accompanied by so great a change in the muscular walls, or there is so strong a tendency to spasmodic contraction of the os internum, that simple dilatation will not cure the dysmenorrhœa or sterility, and it becomes necessary to resort to divulsion or a modification of Sims's operation, which is a combination of divulsion and incision, with the use of a hard-rubber intra-uterine drainage-tube instead of a glass plug or stem pessary. I employ the above preparatory treatment with pledgets of cotton saturated with glycerin, etc., always carefully treating any complication, such as periuterine inflammation, beforehand; for as long as the uterus is fixed by old adhesions any dilatation or operative procedure is attended with risk. When the uterus is movable, so that the cervix with little resistance or pain can be pulled well down to the vulva while the patient is in Sims's position, it is usually safe to operate. My patient is instructed to take a laxative and bath, to have fresh clothing, bedding, etc., and to take a vaginal douche of solution of bichloride, 1 to 3000, preparatory to the operation. Instruments needed: one dozen sponge-holders, with new aseptic sponges; Sims's speculum, depressor, forceps, sound, tenaculum, uterine dilator, applicator, hard-rubber drainage-tube, a needle-holder, and a threaded slightly curved needle with silver wire, to be used in case the circular artery is severed. A straight bistoury can be used in place of a Sims uterotome, and, unless the tissues above the os internum are to be divided, it will do nearly as well. These instruments are all immersed in 5-per-cent. solution of carbolic acid. The patient, being etherized, is put in Sims's position; the vagina is carefully sponged out with 1 to 3000 bichloride solution; a strong tenaculum is fixed in the anterior lip of the cervix, which is pulled to the vulva. With the sound the

FIG. 176.

Wylie's Hard-rubber Intra-uterine Drainage-tube, nine in set, three sizes in length, and three calibres: Nos. 18, 20, and 22 (American measure).

uterus is explored; the dilator is then introduced, and the uterine canal slightly dilated, so as to allow the blade of the bistoury to pass readily. If the shape and condition of the cervix requires it, the cervix is divided posteriorly. The blade of the latter is then introduced, cutting edge backward, up to the os internum or the point of flexion; the posterior wall of the cervix is divided in the median line for half an inch or more, according to the length of the infravaginal part of the cervix; the lining mucous membrane is divided the full length of the cervix; and the muscular walls are also divided for some distance under the external mucous membrane covering the infravaginal cervix. As a rule, there is very little bleeding, and where the circular artery is normally placed it will not be divided. It is a mistake to divide all the muscles, and especially the vaginal mucous membrane of the cervix, as far as the vaginal junction. After this incision the dilator is introduced and the os internum freely divulsed. Dr. Sims always divided the anterior wall at the os internum with his uterotome, but I have for several years past trusted to the dilators to overcome all constriction at this point, for I have never seen a full-sized plug introduced after the incision through the os internum without the free use of the dilators. The dilatation should be done slowly, so as to give time for the tissues to stretch and not tear. In many cases the amount of force needed to overcome the constriction is very great—not less than the full force of the grip of one hand; if this force be kept up for a minute or two, it will usually suffice, and it is well to repeatedly try to introduce the intra-uterine drainage-tube, and to be satisfied with the amount of dilatation when a full-sized moderately curved tube can be introduced to its full length (two and a quarter inches), and remains in place without being held in position. It is at this point of the operation that failure is often made, for many times the point of the tube, especially if straight, strikes at the os internum at the point of flexion, and forms a pouch behind it, which, with the elongation caused by the stretching of the cervix, allows the tube to enter the cervix almost to its full length. This leads the operator to think that it has entered the cavity of the fundus, and he inserts his tampon, etc. Now, the test whether the tube has passed the os internum and entered the cavity of the fundus is, that it will remain in place and not tend to spring back and out as soon as pressure is removed. Once it is well through the os internum, it is grasped by the circular fibres and remains in place. In some cases, of course, it is more difficult to pass the tube than in others. Where the flexion is decided and the lining membrane of the cervix lax, the point of the tube invariably glides behind the os internum and puts the lining membrane and the posterior wall of the cervix on the stretch. More than once I have seen this operation done, and the tampon put in to hold the tube forcibly in place, and afterward had the opportunity

to prove that the cavity of the fundus had not been entered by either the knife or tube. Even in the hands of Dr. Sims himself I have seen failure to get a good-sized glass plug in at one sitting. I am quite certain that this difficulty accounts for some of the failures to do good by this operation. In certain cases it would seem next to impossible to introduce Simpson's or Peaslee's uterotome, or any straight instrument, without first dilating the external os by tents or other means to relax the os internum and straighten the canal. Straight dilators may be made to pass up into the cervix two inches or even more, but they will push the os forward or to one side, and will not enter the cavity of the fundus of the uterus, characteristic cases needing dilatation. I have had Sims's dilator made with blades curved so that it can be passed as readily as a sound. It should be of the very best steel, so as not to yield under pressure, and the joints should be sufficiently far back to allow the blades to open and yet remain nearly parallel. The joint is held by an adjustable screw that enables it to be taken apart to be cleaned.

When the tube can be readily passed into and through the os internum, it is well to apply a little pure carbolic acid on an applicator to the lining membrane of the cervix, then to replace the plug, cleanse the vagina, and blow into it a half drachm of iodoform; this is absorbed more slowly and remains longer than any other antiseptic. Dr. Sims made it a rule to insert styptic cotton against the plug and cervix, and then over this a firm tampon, the object being to prevent hemorrhage and at the same time keep the plug in place. I do not place the pledgets until the hemorrhage is completely checked, and usually the pressure of the tube stops the oozing if there is any. If the circular artery is cut, I ligate it by passing a silver suture around and twisting it. When all oozing has ceased and the tube is in place, pledgets of cotton squeezed out in 1-to-5000 bichloride solution and sprinkled with iodoform are put under and in front of the tube, the object being to keep the tube in position. After each urination the vulva should be washed with antiseptic solution (bichloride 1 to 5000), and iodoform sprinkled over it for several days. On the third day I remove the cotton and insert fresh pledgets after thoroughly cleansing the vagina, the tube being left undisturbed. On the sixth or seventh day I remove the tube, and after cleaning it and the vagina I replace it and keep it in position either with iodoform cotton pledgets or a vaginal pessary. It is allowed to remain for a week or two longer as the case may seem to require it. Dr. Sims usually removed the tube on the fifth day and left it out, but I prefer to retain it in place until the surface is entirely healed. Unless the tube is a very large one it can safely be left in place during menstruation. I use intra-uterine drainage-tubes which have one or more deep grooves in them, so as to permit free drainage, and my objection

to the iron or styptic cotton and large firm tampons is that drainage is obstructed, and thus the risk of septicæmia increased, and the fluid dammed back in the uterus may be forced into and through the tubes into the peritoneal cavity. When the case has been properly prepared and the above precautions have been taken, the risk is very slight and the result most satisfactory. To get good results one must do all that can be done to improve the general health of the patient and give the proper preparatory treatment, which not only lessens the chances of doing harm, but also enables one to carefully study the case and patient and eliminate complications, such as diseased tubes or ovaries, etc. If one takes a delicate and weak woman with an imperfectly developed uterus, with a degenerate and granular eroded mucous lining, and divides the cervix *too freely*, or when discission is not needed, he may relieve the dysmenorrhœa, but he will do his patient harm, and sooner or later she may have an everted and diseased cervix resembling a lacerated cervix and requiring the same treatment.

If one divulses the cervix or divides it with a knife while the patient has a diseased tube tense with an irritating or poisonous fluid or a diseased ovary filled with tense cysts, any of these may burst or break and cause local peritonitis. Or if one operates, without using antiseptics or preparatory treatment, upon a patient with a diseased mucous membrane, he may cause the extension of the local poisoning to the deeper uterine or periuterine tissues, and get what we call inflammation; but this is the fault of the operator and not of the operation. Eliminate failures to diagnose serious complication, and blood-poisoning from lack of care in cleanliness or from prejudice against the use of antiseptics, and this operation becomes one of the simplest in uterine surgery.

I have never believed in the necessity of the bilateral operation. In those cases where Dr. Sims recommended it I would dilate and drain or divulse and keep open with a drainage-tube.

If the dilatation is imperfectly done, the relief, of course, is only temporary, but when thoroughly done and repeated, say twice in two or three months, it will often effect a permanent cure in cases of even ten years' standing. I know several whom I treated as long ago as six or eight years, and they are well to-day. Undoubtedly, there are cases that can be relieved of dysmenorrhœa, but not cured of sterility; for there are some cases in which the organs have reached only a very imperfect degree of development, or have atrophied and changed so much that they cannot be fully developed by any treatment. In some of these the local application of electricity will do good by stimulating development. It is a simple matter to apply electricity, but its use must be kept up for several weeks before it will have a perceptible effect. The galvano-electric pessary of Simpson may be used in cer-

tain indolent cases, but it must be closely watched. A good drainage-tube of hard rubber is much safer and perhaps equally efficacious. If a woman with dysmenorrhœa is to marry, she should marry early in life, for the chances of pregnancy and full development then are undoubtedly better than later. I am certain it helps these cases, for normal erotic excitement stimulates development and averts abnormal functional derangement and bad habits.

Childbearing is the best means of completing development and making a permanent cure in such cases. One would expect that small, imperfectly-developed uteri would be torn more frequently than in the average case of labor; and this is a fact, especially if the labor is quick, for the cervix requires time to get into the best condition for full expansion. I have found that more depends upon the condition of the mucous membrane at the time of laceration and shortly after labor than upon the size of the os or the extent of the tear. Diseased tissues heal badly and tend to swell, evert, etc.

Sponge Tents.—For more than ten years I have not used tents in these cases. Without doubt, some cases can be cured with them, but their use is more dangerous than that of the dilator, and much more uncertain in results. If tents must be used, I have them made with iodoform mixed in the gum, and I use iodoform and bichloride tampons to keep them in place. I never allow them to remain more than twelve hours, for they form a most excellent nidus for germs, and for a time they prevent drainage from a very much irritated, rapidly secreting mucous membrane, and may force some of it into the Fallopian tubes, etc.

Dilatation by Sound.—Whenever I see a specialist using a set of graded uterine bougies or sounds, especially such as are nearly straight, I know that he is travelling over an old road that was pointed out by Mackintosh many years ago. The uterus is too movable and elastic to permit of the use of sounds to the best advantage, and many a case has been sounded up to the os internum and not beyond.

To Simpson belongs the credit of the first uterotome, but Sims was the first to perfect that instrument and to understand fully how to use it. He pointed out the mistake of using automatic and straight uterotomes in the uterus.

In June, 1873, Dr. John Ball of Brooklyn, N. Y., read a paper before the Medical Society of Kings county on rapid dilatation of the cervix uteri for the relief of stricture, etc., and in 1877 he presented a paper on the same subject before the New York State Medical Society. About this same time Ellinger of Stuttgart advocated forcible dilatation. Dr. Ball reported a number of cases successfully treated by rapid dilatation, and in this country introduced the method of "rapid dilatation" now so earnestly advocated by Dr. Goodell, whose methods are

essentially those of Dr. Ball. There can be no question about the success of divulsion, but there are many cases which can be perfectly cured by moderate dilatation, which is not only less dangerous, but I think gives better results in those cases where imperfect development is more marked than spasmodic stricture. For it is not a powerful and spasmodically constricting muscle that is to be overcome, but a feeble, degenerate organ that needs to be stimulated to healthy development. In cases of atresia of the cervix where the vaginal cervix is large and only slightly flexed and pointed, where Dr. Sims advised the bilateral incision, I use divulsion and insert a drainage-tube; and I do the same in cases of chronic catarrh where there is indication of stricture of the cervix. But when I am treating sterility, and have a flexed, hard, and pointed cervix to deal with, I am sure that the knife, applied as above advocated, is an improvement upon simple divulsion, for the os externum tends to contract and close the opening after the latter operation unless the tissues are torn by the instrument. Still, I confess that we could more easily dispense with the uterotome than with uterine dilators. There is less risk in opening the uterine canal with dilators than with the uterotome, but dilators can do serious harm when the dilatation is carried too far; and if one uses a screw to force open the dilators the risk is greater than when he uses his hand or hands to regulate the amount of dilatation.

Use of Pessaries in Dysmenorrhœa.—If the use of pessaries in such cases had never been taught, much harm would have been averted and more progress made in the right direction. Only very rarely can we afford some relief by the use of an anteflexion pessary, but at best it is only palliative and can be dispensed with. It is not so much by straightening the flexion that the pessary does good as by preventing prolapse, and perhaps by steadying the fundus. As to the use of stem pessaries for straightening the canal, they may do good by stimulating development, but many of them are dangerous instruments.

Membranous Dysmenorrhœa.

If we could accept the desquamative theory of Dr. John Williams, it would be easy to explain membranous dysmenorrhœa; and if the view advocated by Kundrat and Engelmann of the growth of the utricular glands and proliferation of round cells before menstruation, and the exfoliation of this proliferated mucous membrane during the flow, is correct, then we could say that membranous dysmenorrhœa is merely an exaggeration of a normal process, and the membrane comes away *en masse* instead of in minute particles.

I am inclined to believe that the process which takes place in the

uterus and leads up to menstruation is one of growth—a preparation for pregnancy (similar to the nutritive node that precedes the formation of a bud on a tree, as Mary Putnam-Jacobi would express it)—and, unless impregnation takes place and stimulates and directs further growth, that disintegration will take place and the accumulated blood escape and the tissues again start another cycle of growth. If this disintegration takes place by fatty degeneration, and the lower or underlying part degenerates before the superficial part disintegrates, the latter may be thrown off in shreds or cast off in one piece. This abnormal process may be the result of the preparatory growth going too far in developing a decidual membrane, or it may be the result of some irritating disease abnormally increasing the supply of blood, thus inducing excessive growth of the lining membrane, or the irritation may so greatly increase the normal vascular tension that the superficial layer is dissected off by hemorrhage in the deeper layer.

Pathology.—The membrane may be thrown off in separate pieces or it may be expelled in one piece, a triangular-shaped sac with three openings—one, the largest, the os internum; the other two, much smaller, representing the openings into the Fallopian tubes. The inner surface is smooth, while the outer surface is ragged and shreddy. Small perforations where the uterine glands have penetrated can usually be detected. It is undoubtedly composed of the superficial layer of the endometrium, with perhaps an abnormal amount of connective tissue.

Symptoms.—In some cases it would seem to be uncomplicated by any definite disease, and the membrane is cast off in tangible pieces every month on the second or third day of the flow, which is accompanied by severe colicky pains, sometimes of the most violent nature. The flow may be somewhat intermittent, due probably to the membrane plugging the os internum. During the flow the patient may be in an exquisitely sensitive or hyperæsthetic state. Other cases are irregular, menstruation being at times nearly normal.

Membranous dysmenorrhœa is often associated with uterine catarrh and other diseases, but these alone do not account for it. A well-marked case usually continues as long as the patient menstruates.

The decidual membrane of an abortion may be mistaken for membranous dysmenorrhœa, but the repeated occurrence of the membrane in membranous dysmenorrhœa and the absence of the villi of the chorion under the microscope as a rule make a diagnosis comparatively certain.

Treatment.—To make sure of a diagnosis it may be necessary to treat, and if possible cure, any existing complication. After this I would treat the dysmenorrhœa in very much the same way as has already been recommended—by free dilatation or divulsion and intra-uterine applications, and the prolonged use of an intra-uterine drainage-

tube. If all these measures failed and the symptoms justified so extreme a measure, with the patient's consent I would not hesitate to remove the uterine appendages to induce premature menopause. As a rule, after thorough dilatation and the proper treatment of complications, the pain will be very much less, and by the use of an anodyne once a month the patient can be made comparatively well.

I have seen severe cases of dysmenorrhœa in which the membrane is not cast off in large, tangible pieces give almost precisely the same kind of persistent colicky pains and cause the same nervously hyperæsthetic state, so that I have concluded that the symptoms were due to the same abnormal conditions as existed in well-marked cases of membranous dysmenorrhœa; but the uterus did not have the power to expel the membrane.

The Menopause.

Take ten or twelve of the best known works on gynecology, and in most of them the word "menopause" is not to be found in the index, and in none is it more than mentioned incidentally.

As a rule, menstruation ceases between the ages of forty and fifty, the average being at about forty-six years of age. It may continue after fifty or stop before forty, but this is exceptional unless caused by disease. Cases of premature menopause have been reported as occurring under thirty, and at a recent meeting of the New York Obstetrical Society Dr. T. A. Emmet reported a case where menstruation had continued apparently normally in a woman seventy years old, but he had not made any local examination.

A woman in perfect general health, and not having any local disease nor any abnormal conditions of the tissues the result of previous local disease, should cease menstruating without any special general or local disturbance; and many women do pass the menopause without suffering. But so common is it for women to have unusual hemorrhage and suffer greatly from reflex nervous affections at this time that it is a popular belief, shared by most of the medical profession, that it is what any woman must expect; and unless life is endangered by hemorrhage or insanity is imminent, it is not to be regarded as an abnormal thing to be carefully investigated and treated. Every specialist knows how common it is for women between forty and fifty years of age to come to him and say that for months, or even a year or more, they have had irregular or more or less continuous flow, etc., and on examination he has found cancerous disease so far advanced that it is too late to give material relief. When he asks why they did not come to be examined long ago, they reply, "I thought it was only change of life, and my doctor did not ask to make an examination." Hemorrhages from fungous granulations, polypi, and fibroids are often neglected

for the same reason until extreme anæmia compels them to seek relief from some one not satisfied in thinking "it is only the change of life."

Premature menopause may be the result of prolonged amenorrhœa after constitutional disease, where from imperfect development or atrophy from local disease, combined with a bad condition of the blood, the organs have permanently lost the power to perform their functions. It is important on this account to examine carefully into the cause of prolonged amenorrhœa, especially in those cases where it continues after the general health has been restored. Sometimes stimulating local treatment arrests the atrophy and restores the organs to a normal state.

Removal of the uterine appendages before puberty would in all probability prevent menstruation in any case, but, although it is the rule for the menopause to be induced by the removal of the tubes and ovaries after puberty, yet in some cases menstruation will continue where the ovaries and the greater part of the tubes have been carefully removed. As Tait's operation is done to-day, usually, from a fourth to three-fourths of an inch or more of the tubes are not cut away, and in many cases the greater part of the pampiniform plexus is left intact. Dr. Mary Putnam-Jacobi in her description of her theory of menstruation gives the most rational explanation that I have yet seen why removal of the appendages does not always stop menstruation.

If menstruation at the menopause is excessive or too frequent, its cause should be investigated as carefully as at any other time. Fungous granulations are very common at this age, and mucous and fibrous polypi are especially apt to develop at this period. If neglected, they may stop bleeding, but not until the patient's general health is injured, either from actual loss of blood or from reflex disturbances caused by the granulations or polypi irritating and preventing the uterus from undergoing normally the atrophy and other changes that should take place at this age.

Strong, vigorous women may menstruate after fifty, but when a woman past forty-eight years of age has excessive or even full menstruation and is anæmic, or is very nervous and at times has "hot flashes" running up and down her back, if the os is dilated and the uterus curetted, either fungous granulations or a mucous polypus or fibroids will, as a rule, be found, and when thoroughly removed the menopause will at once come on, and if the cervix is occasionally dilated the nervous symptoms will disappear.

In four instances where women long past the menopause have come to me for vague nervous symptoms similar to those common at the menopause, on examination, finding the uterus abnormally large for

that time of life—one was sixty-three years old—I dilated and removed shrivelled-up polypi. In one case the largest resembled a small dried pear. The final results were good in every case.

In the spring of 1880 a rather thin, wiry woman was sent to me by Dr. Greenough of this city. She said that she had dysmenorrhœa when young, but had not had any special uterine disease that she was aware of. She had married when thirty, and about five years later her menstruation had ceased, and had not shown itself except two or three times, when she had a scanty flow, for the past two years, and that during this time she had had hot flashes and all kinds of nervous symptoms, had taken all kinds of remedies, but that she was growing thin, sleepless, etc., and that Dr. G. advised her to have a local examination. I found the vagina and uterine appendages normal so far as I could discover; the uterus was a little below the normal size, but not as small as is usual two years after the menopause. It was anteflexed and in about the normal position. In and near the os the mucous membrane had a peculiar coppery or yellowish stained appearance, which I had now and then seen about the cervix uteri of women past the menopause. In passing a sound I found the os internum contracted, and as the sound passed into the cavity of the fundus it gave exquisite pain, and reminded me so forcibly of the condition of the uterus so very common in young women suffering with dysmenorrhœa due to imperfect development that I made up my mind to give it the same treatment as I was then using for the relief of dysmenorrhœa. I gave the usual preparatory treatment, and dilated the cervix with a steel dilator, and applied, by means of an applicator and cervical protector, pure carbolic acid to the endometrium. I warned her, as I do in cases of dysmenorrhœa, that the first dilatation might be quite painful and increase her nervousness for a day or so, but that the second would not be so painful, and the third still less so, and that if this treatment helped her I could probably cure her. The dilatations were made about a week apart. The result was magical: her nervous system quieted down, she could sleep, eat well, and she steadily improved in general health. Twice within six months she had a slight return of the reflex symptoms, and the dilatation and applications were repeated with equally good results. In a year's time she had gained twenty-six pounds in weight and claimed to be perfectly well. Since then I have treated a large number of cases suffering from reflex nervousness at and soon after the menopause by dilatation and applications, and with most excellent success. In two or three of these cases the nervousness was extreme, and the patients had been through all kinds of treatment in the way of medication, water-cures, and even "rest-cures," without permanent relief; yet they were cured in a very short time by dilatation and intra-uterine applications.

In some cases the peculiar appearance of the mucous membrane at the os is not present, but the cervix to the os internum may be perfectly normal, and the subjective symptoms may not directly point to any local disease; yet when the sound is passed you get the characteristic pain, and often a slight flow of blood may escape from the os as the sound is withdrawn. The following case is a good illustration: A handsome fleshy woman, fifty years old, married thirty years and never pregnant, came to me complaining of palpitation, irregular action of the heart, extreme nervousness and sleeplessness, with loss of appetite, and occasionally an acid diarrhœa the result of indigestion. She had recently lost her mother and two other members of her family, which at first seemed to account for her condition. No organic lesion of the heart, kidneys, etc. could be found, and she said that several months previous her menses had ceased without giving her much trouble, but now and then she had hot flashes. At this time no local examination was made, and for three or four months she was treated for her indigestion and what seemed to be nervous prostration; finally, anodynes had to be freely used, and there was no improvement. In going over her case I learned that she had been treated for uterine displacement in early life, and had worn a pessary for ten or fifteen years, but six or eight years ago had removed it and got along as well without it as with it—that she had at times some dragging sensation about the back and sides, and still had at intervals the "hot flashes." She consented to a local examination. I found great relaxation of the vaginal walls and marked prolapse with the fundus backward. The cervix seemed perfectly healthy. The prolapse was treated by means of cotton pledgets saturated with glycerin and boro-glyceride-and-alum mixture, and all local symptoms were relieved, but her reflex nervous symptoms continued. Three weeks later, when the sound was introduced the endometrium at and above the os internum was found exquisitely sensitive, and the uterine canal measured three inches in depth. The cervix was dilated and pure carbolic acid applied. After the third dilatation every symptom disappeared, her menses returned, and for six months were perfectly regular and she was in excellent health. She passed the seventh month without menstruating, and when the next menses were due her heart trouble, indigestion, and nervousness came back. One dilatation relieved her, and now her health is as good as ever.

Whether this hyperæsthetic condition of the endometrium is due to a subacute form of endometritis or the result of previous disease affecting the tissues in such a way as to prevent them from undergoing normally the changes that should take place at the menopause, is yet to be determined; but the success of dilatation of the cervix uteri and applications of pure carbolic acid to the endometrium, combined with the use

of cotton pledgets saturated with a mixture of one of alum, two of boro-glyceride, and fourteen of pure glycerin, placed in the vagina twice a week to stimulate and improve the circulation of the pelvis, has been such as to convince me that much suffering, and perhaps some cases of insanity, can be prevented if the treatment is properly applied in well-marked cases of reflex disturbances occurring with the menopause.

STERILITY.

By A. REEVES JACKSON, A. M., M. D.

Chicago, Ill.

According to statistics based upon many thousands of observations, about one marriage in ten is unfruitful. This fact alone is sufficient to establish the great importance of the subject of sterility, whether it be viewed from a scientific, social, or politico-economical point of view.

While, in this article, my observations will have reference especially to the sterile condition as it affects the woman, it is obviously necessary to notice the fact that in any case of infertile marriage the lack may be attributable to the male, and that in settling the diagnosis this possibility should always be considered. Indeed, the observations of recent writers seem to show that the fault lies much more frequently with the male than has usually been supposed. Thus, Kehrer[1] examined 40 cases in which he investigated both the male and female, and, omitting the consideration of some doubtful cases, the male was found to be in fault in 31.5 per cent. of the entire number. Noeggerath found 8 in 14; Gross,[2] basing his conclusions on the examination of 192 cases, including the above, states that the male was deficient in one case out of every six. The proportion may be even greater than this, for, while the data quoted by Gross are of much value, they are quite insufficient to determine the question.

The essential conditions of human fecundation are these:

1. Semen containing living spermatozoa must be deposited within the genital passages of the woman.

2. A spermatozoon must come in contact with a mature healthy ovule at some point beyond the internal os uteri—that is, in the cavity of the uterus, in the Fallopian tube, or on the surface of the ovary.

3. To enable the impregnated germ to become developed into a viable new being it must find a suitable location for lodgment and nourishment.

The elaboration and deposition of the semen constitute the special functions of the male. Those of the female are threefold, and comprise the reception of the male organ, ovulation (including the matura-

[1] *Centralblatt für Gynäkologie*, No. 23, 1879.

[2] *Med. Sterility.*

tion and dehiscence of the ovule), and the furnishing of a proper nidus for its attachment and nutrition.

The necessary functions, then, for the reproduction of the human species are as follows:

1. Insemination;
2. Impregnation;
3. Ovulation;
4. Gestation;
5. Parturition.

Any one or more of these processes may be defective, although the latter will not concern the present inquiry.

1. Incapacity for Insemination.

A number of circumstances may interfere with the process of insemination. They may arise from default on the part of either the male or female.

A man may possess ample virile power, the genital organs may not present any abnormality, and yet semen may not be secreted; or, semen may be secreted in proper quantity, but contain no spermatozoa; or, the spermatozoa may be few in number, motionless, or their movements may speedily cease after emission. In short, the man may be sterile.

Or he may be impotent. By this term is understood the inability to accomplish the sexual act. This condition may depend upon a variety of causes, and may be absolute or relative, permanent or temporary. Aside from vice of conformation or other imperfection of the genital organs, the defect may result from long and exhausting diseases, from the premature or excessive use or from the abuse of the sexual function; or it may arise from purely moral causes. Cases of the latter class are of great interest and frequency. Mere timidity sometimes results in sudden loss of power under circumstances in which it should be greatest, the fear of being unsuccessful sometimes becoming the cause of failure. A wife may by lack of complaisance cause impotence in a husband who with proper encouragement would have full virile power.

Frigidity, which is not uncommon in the woman, is rare in the man. This condition is characterized not only by absence of erection, but by absence also of venereal desire.

Seminal fluid is deposited in the vagina by the function of coition, the joint act of the male and female. In this process the male is essentially active, while the female is relatively passive. With the former, erection of the penis is necessary to penetration, and orgasm to ejaculation: with the latter, there is frequently neither erection nor orgasm. However, if the act be normally and perfectly performed, both parties should participate in both erection and orgasm.

The female is provided with an apparatus which, under strictly normal conditions, is capable of effecting an erection as completely as occurs in the male, and the mechanism is similar in both. Under the influence of sexual excitement the female blood flows in increased amount to the cavernous bodies of the clitoris and the bulbs of the vagina. These erectile structures are encircled at their base by constricting muscles which obstruct the return flow of blood, and cause them to attain their maximum degree of turgescence and hardness. At the same time, the glans of the clitoris becomes endowed with an exalted degree of sensibility, resulting in the venereal orgasm. Under the same excitement the levator ani muscle, embracing the lateral and posterior portions of the vagina in the form of a deep crescent, contracts and presses the erected penis from behind and from both sides forward against the anterior pelvic wall (Hildebrandt). The clitoris, in its hardened condition, does not change its direction, as does the male organ, but, being fixed by its frænum, projects downward and forward toward the vaginal orifice, and during coitus is brought into nearer contact with the dorsal face of the penis, and the repeated frictions become the chief cause of voluptuous sensations.

The observations of Litzman,[1] Wernick, Pallen,[2] Beck,[3] Mundé, and others have shown that the orgasm affects the uterus also in a remarkable manner. At the height of excitement the organ assumes a more perpendicular position and sinks lower in the pelvis. The os becomes softer and rounder, dilating and contracting with rapid alternations, while at the same time the labia project and retract in such a manner as to constitute a "suction" effect, each gaping being accompanied by the emission, almost in jets, of clear, viscid mucus (Mundé). This process is of short duration—shorter than the orgasm in the male—and at its close the parts return to their ordinary state.

Although it has never fallen to my lot to witness the local phenomena of orgasm in the female, I have, while making digital examinations, frequently been conscious of a change occurring in the position of the cervix, with a simultaneous softening of the part.

Knowing as we do how perfectly means are adapted to ends everywhere in the construction of our bodies, it is reasonable to suppose that these provisions would not exist without reference to the perpetuation of the species.

Many women deny absolutely that they experience any orgasm or any degree of pleasurable sensation during the sexual act. Such women are impotent. The impotency does not, however, imply sterility, for it is admitted that women who are thus functionally deficient may conceive and bear children, although they are less likely

[1] Flint's *Textbook of Physiology*, 1879, p. 891.

[2] *St. Louis Med. and Surg. Journ.*, 1872. [3] *Am. Journ. Obst.*, vol. viii. p. 507.

to do so than those in whom the functions are normally performed.

The causes of impotency in women, when purely functional, are not understood. The condition may be the result of some nervous defect, or in some cases may be purely psychical. It is doubtless a not infrequent cause of domestic unhappiness, and possibly of disease.

The sexual sense in women varies greatly. In some it seems to be quite as keen as in the male; in others—and this class comprises the greater number—it exists in moderate degree, its intensity being in proportion to the more or less favorable character of the exciting circumstances. In still others—a considerable number—it is wholly absent, or at least not evoked by the sexual act. Even among this latter class it is possible that the capacity for sexual enjoyment is not so entirely deficient as is commonly thought, but held in abeyance for want of sufficient stimulus. Certain abnormities of the pelvic organs are known to influence sexual desire. Versions of the uterus have been known to abolish it, the wearing of a pessary to restore it, and the removal of the instrument to be followed again by its loss.

Dr. E. J. Ill has reported[1] that in 44 cases in which trachelorrhaphy was performed for laceration of the cervix uteri there were 34 in which there was loss of sexual appetite and orgasm before the operation; in 1 case there was increase (nymphomania); 3 of the subjects were widows; and from 5 he could get no answers to his inquiries. Of the 34 cases, 27 were entirely cured, and regained sexual desire and potency after the operation. In the remaining 7 sexual appetite did not return. Dr. Mundé[2] also mentions a case in which the closure of a laceration of the cervix uteri restored sexual power, which had been lost apparently by the injury. These observations have an evident bearing upon the theory of uterine orgasm, for a laceration of the uterine cervix extending beyond the crown would obviously interfere with the alleged suction-power of the os uteri; and if this constitutes a feature of the orgasm, the latter would be interfered with also.

On the contrary, certain other pathological conditions are known to greatly intensify the sexual desire, this being especially true of congestion and inflammation of the ovaries. Some women are absolutely frigid except at or near the menstrual period.

By some it is thought that uterine erection is necessary to conception, and that the absence of orgasm is no proof that some degree of erection does not take place. Those who hold this view believe that conception is more likely to happen when the orgasms in the male and female occur simultaneously, or when that of the male is precedent; that the semen is projected into the uterus at the moment of ejaculation, or is drawn in by the subsequent aspiratory action of the uterus already mentioned;

[1] *Trans. New Jersey Med. Soc.*, 1882. [2] *Am. Journ. Obst.*, vol. xv. p. 908.

and that the spermatozoa have no power of self-propulsion whatever.

That the jet of semen does sometimes enter directly the uterine cavity at the time of emission is very probable, although the fact is not at all proven by such a case as that mentioned by Adelon,[1] who states that Raisch examined a woman killed by her husband in the very act of adultery, and found semen in the body of the uterus;[2] for the presence of the fluid may have been the result of a previous act of intercourse. Nor does this view of the process by any means preclude the existence of, or the necessity for, a self-propelling power on the part of the spermatozoa, by which they are enabled to pass upward when deposited in the lower part of the vagina within or even upon the external genitals, or to make their way through minute openings in any part of the generative passages.

The obstacles which are sometimes overcome by spermatozoa in their onward journey are almost incredible. Bozeman[3] relates a case occurring in his own practice in which there was a continuous flow of urine from the os uteri arising from a vesico-utero-cervical fistula. Notwithstanding this adverse current they reached their destination in the cavity of the uterus, and conception, gestation, and a safe delivery followed. The same writer mentions another case which happened in the practice of Simon, in Heidelberg, in which a vesico-vaginal fistula, complicated with stenosis of the vagina, had been operated upon for incontinence of urine by closing the mouth of the vagina about half an inch behind the meatus urinarius. The operation was so nearly successful that an opening only the size of a cambric needle was left. Strangely enough, the spermatozoa passed through this minute orifice, traversed the stenosed vagina, which was then the receptacle of the urine from the bladder, and made their entrance through the os uteri into the cavity of the organ. Conception and gestation followed, but resulted in the death of the patient. Courty,[4] Winckel,[5] and others have reported similar cases. The former also relates a case in which the entire uterus was removed by Koeberle, the ovaries being left. A small fistula remained, forming a communication between the vagina and the abdominal cavity. The woman subsequently had an abdominal pregnancy.

The following case may serve to illustrate not only the difficulties under which conception may take place, but also the fact that gestation may sometimes continue under most adverse circumstances:

[1] "Génération," *Répertoire général des Sciences médicales*, tome xiv. p. 68.
[2] Pallen, *Amer. Journ. Obst.*, 1880, p. 519.
[3] *New York Med. Journ.*, Dec. 24, 1884.
[4] *Uterus, Ovaries, and Fallopian Tubes*, p. 789.
[5] *Med.-Chir. Rundschau*, Dec., 1877

Conception while Wearing an Intra-uterine Stem.—Emily T——, aged twenty-five years, came under my care August 21, 1884, for dysmenorrhœa. She had been married three years, and had not been pregnant. I found, on examination, a marked anteflexion of the cervix, which was conoidal and pierced by a typical pinhole os. It was only with great difficulty that I could introduce a probe into the cavity of the uterus. On September 2d, under etherization, I forcibly dilated the cervix to a moderate extent and introduced a Chambers divaricating stem. Menstruation occurred September 19th, and again October 18th, each time with pain, although less than heretofore. On November 19th a menstrual period commenced which lasted four days and was painless. No discharge appeared during December or January. On January 23, 1885, I examined her and found that she was undoubtedly pregnant. I carefully removed the stem, the operation being attended by a slight flow of blood and mucus. I was fearful that an abortion would follow, but there was no untoward result, and a male child was born September 4th, at term.

Coitus may be Impossible.—Besides the various physical and functional causes of male impotence, there are many conditions on the part of the female which may prevent the accomplishment of the sexual act. Among these may be enumerated the following:

Faulty development of the external genital organs;
Hypertrophy of the labia;
Hypertrophy of the clitoris;
Tough or hypertrophied hymen;
Atresia or stenosis of the vagina;
Vaginal or vulval tumors.

Faulty Development of the Genital Organs.—The abnormities of the external sexual organs which may prevent intercourse are congenital or acquired, and may result either from insufficient or excessive development.

Among the minus conditions of development are those in which there is absence of some one or more of the vulval organs. The absence of the clitoris, hymen, or labia, or their rudimentary growth, would obviously not interfere with coitus, provided the vagina were sufficiently pervious. The latter organ is, however, sometimes completely absent or defective in its lower portion, a mere depression presenting between the labia majora, at some portion of which is found the meatus urinarius. In some of these cases repeated attempts at intercourse have resulted in the conversion of this opening into the copulative organ.

Sometimes the vagina is divided by a longitudinal septum which may interfere with congress unless one or both sides be sufficiently capacious for intromission.

Dr. E. D. Mapother reports[1] the case of a lady, twenty-eight years of age, who remained sterile after eight years of married life. An examination discovered the existence of a membrane which crossed the vagina at right angles three inches above the carunculæ myrtiformes. In this was a circular hole one-sixth of an inch in diameter, through which the sound passed into a cavity above. The membrane was excised, its removal disclosing a normal os and cervix. A glass dilator was worn for five weeks. Pregnancy ensued.

Either as a congenital condition or as a result of subsequent inflammation the labia majora are sometimes adherent partially or throughout their whole extent, an opening for the escape of urine only being left and the line of union being marked by a mere chink or furrow.

Hypertrophy of the Labia.—An opposite and more numerous class of cases than the foregoing is that in which congress is prevented by undue enlargement of the parts from excess of development or as the result of disease. Any of the organs may be thus affected. Scanzoni states that he knew a family residing near Würzburg in which the mother and three daughters had the labia excessively developed in a manner similar to that of the Hottentots. He also mentions the case of a girl of seventeen at Prague in whom the hypertrophied labia formed a tumor larger than the head of an adult man, hanging down to the middle of the thighs. About the year 1865 I saw an unmarried woman, about twenty years of age, who had an hypertrophy of the left side of the vulva involving the greater and lesser labia throughout their entire extent. It formed a protuberance larger than a hen's egg, which would evidently have been an impediment to intercourse. The enlargement was congenital, and had not perceptibly increased for many years. Surgical interference was declined.

The labia may also be greatly enlarged from elephantiasis or from the presence of fibrous, cystic, or other tumors, so as to prevent marital congress.

Hypertrophy of the Clitoris.—The clitoris has been seen so excessively developed as to resemble the male organ, and even to weigh several pounds, closing completely the entrance to the vagina.

Tough or Hypertrophied Hymen.—The hymen may be so thick and so dense in structure as to prevent intercourse. It has been developed in such a manner as to project in the form of a fleshy tumor between the labia.[2] Yet it is well known that while such condition of the hymen may prevent intromission, it is no absolute bar to conception, providing the organ be perforate, for a single drop of semen finding its way into the vagina of an otherwise healthy woman may result in pregnancy. The hymen has not infrequently been found intact at the onset of labor,

[1] *British Med. Journ.*, Sept. 4, 1880.

[2] Boivin and Dugès, *Traité des Maladies de l'Utérus.*

showing that its rupture is not necessary to conception. Usually, this condition has been found in unmarried women who have permitted liberties within what they believed to be safe limits; but it has also been observed in married women from unusual rigidity, great distensibility, or defective virility on the part of the husband.

Atresia or Stenosis of the Vagina.—As already stated, the vagina is sometimes, though rarely, imperforate in some part of its course. This results, after puberty, in menstrual retention. A more frequent condition, which may be either congenital or acquired, is a narrowness of some portion of the canal. Stenosis of the passage throughout its entire extent, whether as a congenital condition or as the result of subsequent cicatrization, is exceedingly uncommon.

Vaginal Tumors.—The vagina may be so occupied by cystic tumors, polypi, or inversion of the uterus as to prevent the admission of the male organ.

2. Incapacity for Impregnation.

Impregnation implies the contact of a living spermatozoon with a mature healthy ovule at some point beyond the uterine cervical canal—a requirement which may be prevented or interfered with, more or less completely, by many circumstances.

Coitus may be Possible, but Difficult or Painful.—This condition, to which the term *dyspareunia* has been given by Robert Barnes, is of very great frequency. It may exist in various degrees, from mere discomfort to such intensity of suffering as to lead to entire abandonment of sexual attempts. In many of these cases the woman may be potentially fertile, lacking only the normal conditions of impregnation. Independently of its influence upon fertility, dyspareunia is a frequent source of domestic unhappiness on the part of both husband and wife. It is of obvious importance, therefore, in every such case to seek for the cause or causes which may be operative. These are numerous, and not always easily discovered; and, inasmuch as women are usually reticent upon the subject unless interrogated, the investigation should be close both in questioning and examination.

The following conditions are arranged for convenience under the head of dyspareunia, but it should be remembered that many of them act in other and more certain ways in the production of sterility than by reason of the difficulty or pain of intercourse occasioned by them. Indeed, merely painful intercourse does not necessarily involve sterility, and in some instances only induces it by limiting sexual relations. The causes of dyspareunia are chiefly the following:

Disproportionate size of the male and female organs;

Awkward sexual attempts;

Vulvitis;

Stenosis of vagina;
Vaginismus;
Vaginal or vulvar hyperæsthesia;
Undue shortness of the vagina;
Lacerations of the cervix uteri;
Inflammation of the uterus;
Disease of the cervix uteri;
Displacements of the uterus;
Prolapsed ovary;
Oöphoritis;
Pelvic inflammatory exudations;
Urethral caruncles;
Fissure of the ostium vaginæ;
Neuromata;
Coccyodynia;
Fissure of the anus;
Rectal ulcer;
Hemorrhoids.

Disproportion of Male and Female Sexual Organs.—This is sometimes very great. The ostium vaginæ may be small or even of normal size, while the male organ may be unusually developed. This sort of ill-mating is occasionally productive of intense distress. The first sexual attempts in such cases are unsuccessful, and if persisted in result in producing irritation and congestion of the structures of the female, and thus induce additional elements of pain.

Awkward Intercourse.—Even in the absence of any disproportion a similar state of irritation of the genitals may be provoked by rough and awkward attempts at intercourse. Usually, the normal vulvar mucus is present in sufficient quantity to so lubricate the parts that penetration is effected without injury to the female organs. But where it is deficient, and not increased by sexual desire or by preliminary dalliance, much suffering may result.

Vulvitis.—Inflammation of the external genital organs may arise from various irritating causes, and declare its presence by tumefaction, heat, tenderness, and a burning sensation. These symptoms are aggravated by the chafing produced by walking or other exercise. Fat women are especially liable to an erythema from the excessive friction to which the parts are subjected. This may proceed to involvement of the deeper tissues, and finally result in glandular or cellular inflammation and abscess. It may likewise extend to the vagina, urethra, and inner surfaces of the thighs. Intercourse in such cases is attended by great suffering, and is, at the same time, most prejudicial.

Stenosis of the Vagina.—Either as a congenital defect, as the result of injury, the action of chemical irritants, or as a sequel of exanthematous diseases, the vagina may be so greatly contracted as to cause painful intercourse or prevent it wholly.

Vaginismus.—By this term is understood a condition of the parts about the hymen and vaginal entrance which, in its more marked forms, results in extreme suffering whenever any attempt is made to effect penetration, or even to touch the parts. The constricting muscles around the mouth of the vagina are thrown into a state of spasmodic action so

great as to occlude the entrance, and the finger when introduced seems held as though it were in a vise. In some instances an apparent cause for this condition may be observed in patches of redness, erosion, or neuromata about the vestibule or the caruncule myrtiformes, but in others nothing whatever can be detected to which the phenomenon can be referred. Usually, the seat of vaginismus is at or near the vaginal entrance. Dr. H. R. Storer has called attention, however, to the fact that there also exists a second variety which is seated higher up, and which, depending upon violent vaginal spasm, expels at once and forcibly everything deposited there; for example, the spermatic fluid. This he was enabled to remedy, and so cure sterility, by resort to a simple ring pessary, which gave the canal something to grasp.

Vulvar or Vaginal Hyperæsthesia.—A similar condition to the foregoing, characterized by extreme sensitiveness of the vulva and vagina, exists sometimes without the presence of the spasmodic constriction which constitutes the essential feature of vaginismus. Usually, the symptom is wholly subjective, and can only be attributed to some occult condition of the nerves supplying the parts.

Undue Shortness of the Vagina.—In some cases the vagina is unduly short, being not more than two or three inches in length, and necessarily maintaining the cervix uteri in a position abnormally near the vulva. Unless great care on the part of the husband be exercised the parts soon become tender and dyspareunia results. According to Courty,[1] this condition of the vagina may be productive of barrenness in another way—namely, by favoring the formation of a copulative sac outside of the axis of the uterine canal, and consequent maldirection of the semen.

About twelve years ago I examined a sterile woman, thirty-two years of age, who had been married five years and who had never menstruated. Her health had always been excellent. The mammæ were large and the external genital organs perfectly developed. She confessed to having both sexual desire and enjoyment. The vagina was not more than two inches in depth, and was very narrow, especially at the upper portion, which terminated in a flat, button-like, non-projecting hardness about a quarter of an inch in diameter, situated at the proper site of the vaginal portion. I was unable to detect any opening in it. With a male sound in the bladder and a finger in the rectum there was felt a firm body an inch long and half an inch wide occupying the place of the uterus. No ovaries could be felt.

Lacerations of the Cervix Uteri.—These do not usually occasion painful intercourse, although I have seen several cases in which there was no other apparent cause for the symptom, and in which the latter

[1] *Uterus, Ovaries, and Fallopian Tubes*, p. 790.

promptly disappeared after the injury was repaired. This condition may also prevent fruitfulness by inducing early abortion.

Uterine Inflammation.—The inflammatory affections of the uterus are almost always productive of pain and tenderness, especially in the lower segment of the organ, which is likewise increased in bulk and lower in the pelvis, and hence more subject to mechanical injury during coitus.

Disease of the Cervix Uteri.—Diseased conditions of the cervix uteri which involve loss of substance or other change of structure sometimes produce pain and undue sensitiveness of the parts. Not always, certainly, for in many cases extensive erosions and hyperplastic conditions of the cervix give rise to no complaint whatever. This is notably true in cervical epithelioma prior to the involvement of the surrounding connective tissue.

Displacements of the Uterus.—Certain malpositions of the uterus occasion dyspareunia by occupying the vagina, as occurs in inversion and prolapsus. Ordinarily, however, the forward and backward displacements, including flexions, act only indirectly through the congestion and consequent tenderness of the organ induced by its abnormal position and shape.

Prolapse of the Ovary.—Whenever an ovary is prolapsed in any considerable degree it commonly becomes excessively tender. It is likewise usually enlarged. It occupies a position more or less low in Douglas's space, where it is exposed to pressure during defecation and to impingement of the male organ during intercourse. Dyspareunia from this cause is in some instances very great—not, however, unless the prolapsed organ be the seat also of inflammation or neuralgia. I have in a few instances found one or both ovaries occupying the lower portion of the vagino-rectal cul-de-sac without giving any evidence of undue sensitiveness, or, indeed, producing any uncomfortable symptom.

Oöphoritis.—When the ovary is inflamed, whether it be in place or prolapsed and whether the inflammation be acute or chronic, the organ becomes extremely sensitive, and dyspareunia from this cause is usually of a most intense character.

Pelvic Inflammatory Exudations.—Inflammatory exudations the result of pelvic cellulitis and peritonitis constitute frequent sources of painful congress, and without careful examination they may be easily overlooked. Sometimes the tenderness will be confined to a single spot of hardness not larger than a pea on one or other side of the uterus. Usually, however, in cases of this character the pain results either from the stretching of adhesions which interfere with the normal mobility of the uterus, or from deposits in the tissues about the ovaries, Fallopian tubes, and in Douglas's space.

Urethral Caruncles.—These consist of proliferations of the mucous

membrane within or near the urinary meatus, and form an occasional cause of both painful intercourse and dysuria. These bodies vary in size from that of a pin's head to a large raspberry, and are sometimes the seat of excessive sensibility. A similar condition, but without elevation of the surface, is one in which patches of mucous membrane in various parts of the vestibule become denuded of epithelium, and are exquisitely painful under the slightest touch. These, as well as the smaller caruncuke, can only be detected by careful inspection.

Fissure of the Ostium Vaginæ.—A slight laceration may be produced at the first sexual attempts, and unless the parts are permitted to rest sufficiently long for healing to take place a fissure similar to those sometimes seen at the anus may remain and become the seat of intense pain.

Neuromata of the Genital Tract.—These are commonly situated on some part of the vulva and in the vagina. The following is the only case of this character with which I have met:

Dyspareunia Cured by the Removal of a Small Neuroma of the Vaginal Wall.—A few years ago I was consulted by a gentleman in reference to dyspareunia on the part of his wife. They had been married four years and were childless, although there was a history of two doubtful abortions at five or six weeks. During the past year intercourse had become gradually more and more painful, and had not been attempted for several months. The seat of pain was just within the entrance of the vagina. An inspection of the vulva revealed nothing abnormal. The introduction of the finger was attended by pain which the patient located on one side about an inch from the vaginal orifice. Pressure or slight friction upon this spot caused intense pain. There was no spasm. When I avoided the spot no pain was produced. Separating the parts antero-posteriorly with a bivalve speculum, I brought the tender space into view. There was neither swelling nor redness apparent: it looked precisely like the opposite side. With the tip of a uterine sound I made pressure in the neighborhood of the seat of pain, and suddenly the patient started and exclaimed, "That's the place!" Thus directed, I could detect a slight elevation of the surface caused by a minute tumor not larger than a grape-seed. Passing a small hook beneath and raising it, I excised it with scissors. Immediately, while the cut surface was yet bleeding, I could press the sound into the spot without evoking the former pain. The sides of the cut were brought together with a stitch, and soon united. The cure was complete.

Coccygodynia, etc.—In addition to the causes of painful intercourse already mentioned, there are others which do not have their seat in the genital organs, but in neighboring structures, and hence the latter should not be omitted from the investigation. Among these the more

frequent are coccyodynia, fissure of the anus, rectal ulcer, and hemorrhoids.

Coccyodynia is the term used to designate a painful state of the parts in the neighborhood of the coccyx. It is usually purely neuralgic in character, although sometimes dependent upon structural disease of the bone, the periosteum, or the surrounding parts. When present, the pain is excited or aggravated by any movement of the part, as occurs in rising from the sitting posture, during defecation, or in copulation.

Fissure of the Anus.—Cracks or fissures at the anus are occasionally a source of very considerable pain during and after intercourse. They are sometimes so slight as to escape detection except by a most careful examination. Their presence may be suspected when defecation is followed by habitual pain or aching, especially if at times there is observed also the discharge of a drop or two of blood.

Irritable Ulcer of the Rectum.—This condition, like the preceding, can only be determined by a rectal examination.

Painful Hemorrhoids.—Hemorrhoids which have become inflamed are sometimes extremely painful, and may then constitute a cause of dyspareunia.

The Seminal Fluid may not contain any Spermatozoa; or, the latter may be Dead or possess Deficient Vitality when Deposited in the Vagina.—The pathological changes which may take place in the seminal fluid, and the conditions of the testicles which result in the absence of spermatozoa or in their scantiness or feeble vitality, are not known. Whatever they may be, they are certainly not usually capable of detection.

Male Sterility depending upon Aspermatism.—In November, 1883, a lady, thirty years of age, who had been married seven years and who had never conceived, consulted me in reference to her barrenness. Her history gave no clue as to its cause. Her health was perfect; every function was properly performed. Her husband was four years older than she, healthy, affectionate, and sexually vigorous. Between them there was no incompatibility of temperament. A careful examination of the generative organs revealed no abnormity of conformation, condition, or position.

In a subsequent interview with the husband I learned that prior to his marriage his habits had been rather irregular, and that at the age of twenty he had contracted a gonorrhœa which resulted in tenderness and swelling of both testicles. At the time of my examination I could detect nothing wrong with any of the genital organs. I suggested an examination of the semen, and a few days afterward placed under the microscope a portion of the fluid taken from the vagina of the wife within an hour after coitus. Not a spermatozoon could be found. This examination was repeated after a fortnight's abstinence from

intercourse with the same negative result. The man was absolutely sterile.

It would seem that spermatozoa belonging to the same emission vary greatly in their power to resist destructive influences. The observations of Sims, Haussmann, and others show that the great majority of them perish in the vagina within a very few hours after their deposition, and that those which retain their vitality cease to move after twelve hours. Some are motionless from the first. Those which reach and enter the cervical canal live much longer. When the external os uteri, the cervical canal, and the secretions were normal, living spermatozoa were found in the passage seven and a half, and by Percy eight and a half, days after coitus.

Healthy Spermatazoa after being Deposited in the Vagina may be Destroyed before reaching the Cervical Canal.—The most frequent cause of the untimely death of spermatozoa is the acid mucus of the vagina. The degree of acidity varies greatly in different women, and in the same woman at different times. Not infrequently, a decidedly sour odor may be detected during the introduction of the speculum, and the mucus at such times will intensely redden litmus-paper. Spermatozoa perish immediately in such a fluid. This condition is thought by some to be more frequent in blonde women with red complexions than in brunettes.

On the contrary, the slightly alkaline mucus of the interior of the uterus is favorable to the vitality of the spermatozoa, as already shown. But when the uterine secretions are altered by disease they likewise cause their speedy death. Levy[1] of Munich made microscopical examinations to determine the condition of the spermatozoa at different intervals after coitus in 60 women who were sterile. Catarrh of the uterus was present in 57 of them. In every case the number of spermatozoa found within the cavity of the uterus was small, and they had all become motionless at the end of five hours. In healthy women the movements continued at least twenty-six hours.

In 408 cases of sterility collected by Kammerer[2] uterine catarrh was present in 342. That the condition is a very common one among sterile women there can, therefore, be no doubt; and Sims and others have stated their belief in its great frequency as a causative agent. But it seems to me that more importance has been attributed to it in this respect than facts warrant. We know that women may conceive when the vagina is constantly bathed with the offensive discharge from carcinoma of the uterus, even when it is so acrid as to cause removal of epithelium and epidermis. It is likewise well known that a continually-leaking vesico-vaginal fistula is no bar to conception. Hence I can-

[1] *Obstetrical Journal of Great Britain and Ireland*, vol. vii. p. 471.

[2] *Transactions New York Academy of Medicine*, part vii. of vol. iii.

not think that the ordinary catarrhal discharge from the genitals is so greatly inimical to the life of the spermatozoa as has been supposed. It is true that the suppression, or even the diminution, of a leucorrhœal discharge may be quickly followed by impregnation, but this fact does not prove that the presence of the leucorrhœa was the cause of the preceding infertility. For, being only a symptom of structural disease which unfitted the uterus for furnishing a suitable nidus for the germ, the abatement of the discharge may be a consequence of removal of the lesion which produced it. Impregnation probably occurs much more frequently in these cases than is supposed, but owing to the defect in the nesting and developmental processes very early abortion habitually takes place.

Biegel has found that all of the following agents are destructive of spermatozoa: water, saliva, sour milk, alcohol, ether, chloroform, creasote, tannin, acetic acid, mineral acids, metallic salts, ethereal oils.

Semen may be Deposited in the Vagina and prevented from occupying a position Favorable to Fecundation.—The emitted semen normally forms a pool in the upper posterior portion of the vagina, into which the cervix uteri settles after intercourse. Every facility is thus afforded for the entrance of spermatozoa into the uterine canal. Various conditions may, however, to a greater or lesser degree, interfere with this disposition of the seminal fluid. Among these may be enumerated the following: absence of the vaginal portion; conical elongation of the vaginal portion; unequal size of the uterine lips; cervical hypertrophy; laceration of the cervix uteri; uterine flexions and versions; prolapse and inversion of the uterus; abnormal attachment of cervix to vagina.

Semen may be favorably Deposited in the Vagina, but unable to advance to the Cavity of the Uterus.—The abnormal conditions which may act as impediments to the progress of the spermatozoa are chiefly as follows:

Atresia or stenosis of the os uteri and cervical canal;
Uterine flexions and displacements;
Tumors of the uterus;
Uterine polypi;
Mucous plug in os and cervix uteri;
Hypertrophied cervical rugæ;
Deformity of uterine cervix and labia.

Atresia or Stenosis of the Os and Cervix Uteri.—Atresia—that is, complete closure of the os uteri or cervical canal—is absolute in its power to prevent conception. Occasionally the os uteri is found wholly imperforate, either as a congenital defect or as the result of adhesive inflammation. Complete congenital closure of the os uteri is very rare: the acquired form may, however, occur from cicatriza-

tion after inflammation produced by injuries during parturition, surgical operations upon the parts, or the application of powerful caustics to the interior of the canal. In these cases only a limited portion of the canal is usually involved.

Not only is the condition a barrier to the entrance of spermatozoa, but also to the exit of mucus and blood. Hence, except in the case of an infantile or non-secreting uterus, it would be attended by recurring pains, and, if of sufficiently long standing, by enlargement of the uterus from retention.

Stenosis, or a narrowing of the cervical canal, may occur at either the external or internal os or at any portion of the passage. The canal of the cervix should be considered physiologically normal when it is able to perform its functions with comparative ease and painlessness. This it may do although of greater length, lessened calibre, and more tortuous direction than usual. It is obstructive only when it does not readily transmit blood or mucus from the uterine cavity or permit the ingress of spermatozoa. A normal cervical canal is hence a relative and not an absolute thing, and cannot be determined simply by measurements.

Whatever may be the method or mechanism by which spermatozoa pass through the cervical canal—whether by a suction process on the part of the female or an inherent power of progression in the spermatozoa—it is certain that the latter are capable of advancing from the vagina inward through a much smaller space than is necessary for the transmission of blood and mucus. Hence a woman may have obstructive dysmenorrhœa and yet not be sterile. Indeed, except in complete closure it is doubtful whether mechanical impediments to the union of the spermatazoa and ovule play so important a part as has commonly been supposed. A constriction of the cervical canal to the size of the minute openings of the uterine extremities of the Fallopian tubes would be regarded as very extreme, and yet the spermatozoa pass through the latter without difficulty.

It should be remembered, too, that there are usually other factors present than the mere narrowing of the canal. When the constriction is at the os externum, the secretions of the uterus are prevented from escaping and the canal above is expanded and filled with a glairy, tenacious mucus, which may be seen to escape sometimes in large quantity by the introduction and separation of a pair of forceps. There is in these cases—whether as cause or effect—a follicular cervical endometritis, the cystic enlargements assisting to impede the exit of the mucous secretion and constituting an obstacle to the ingress of the sperm.

I do not by any means deny that even a moderate degree of constriction may hinder, to some extent, the passage of spermatozoa, or that, when the narrowing is great, there is commonly both dysmenorrhœa

and sterility present; but it is well known that in such cases, while dilatation may be effective in wholly relieving the dysmenorrhœa, it is more likely to fail than to succeed in removing the sterility.

Flexions and Displacements of the Uterus.—These do not necessarily determine sterility, although conception may be difficult where they exist. I have known many instances in which there existed a flexion so acute as to prevent the introduction of the sound and to occasion severe dysmenorrhœa, and yet conception took place shortly after marriage without the subject having undergone any treatment whatever. Nevertheless, when flexion is so extreme as to bring the opposing uterine walls into firm contact, there would manifestly be interference with the progression of spermatozoa. In 114 cases of sterility reported by Biegel in which the causes seemed evident there was some form of displacement in 40—that is, 35 per cent. In 26 there was version, in 12 flexion, and in 2 prolapse. Mayer's 272 cases show 60 of anteflexion, 37 of retroflexion, 35 of anteversion, 3 of retroversion—nearly 50 per cent. In Kammerer's table of 408 cases[1] there were of anteflexion, 83; retroflexion, 71; descensus, 8; prolapse, 1—nearly 40 per cent. In 72 cases observed by myself (p. 463) there were 16 of anteflexion, 9 of retroflexion, 3 of anteversion, 7 of retroversion—40.3 per cent.

It would appear from these tables that displacements of the uterus constitute a very frequent and important feature in the causation of sterility; and doubtless such is the fact. But what has been stated in regard to uterine catarrh is equally applicable here—namely, that in all or nearly all cases of chronic displacement there are present other complicating morbid conditions to which the infertility may be ascribed with as much plausibility as to the malposition.

Tumors of the Uterus.—Fibro-myomata, especially when located in the cervix, are sometimes so situated as to prevent, or at least greatly obstruct, the passage of semen through the cervical canal. When they are small and occupy the lower portion of the cervix, they do not usually produce either pain or menorrhagia, and may hence be readily overlooked unless their possible presence be taken into consideration. Such tumors may distort the uterine cavity and cause catarrh and thickening of the lining membrane, and thus act both mechanically and chemically.

Submucous tumors of the uterus may prevent conception by the menorrhagia which they usually cause, the profuse flow of blood carrying the ovule away from the uterine cavity. Winckel reports[2] that the most common complication of uterine fibroids found by him was the existence of adhesions between the uterus and neighboring organs, these being present in 21 out of 34 cases examined.

Uterine Polypus.—Polypi of the uterus which wholly or partially

[1] *Loc. cit.*

[2] *Med.-Chirurgical Rundschau*, Dec., 1877.

obstruct any part of the cervical canal may act as an impediment to the onward movement of spermatozoa. If a polypus becomes strangulated and gangrenous, as sometimes happens, the resulting acrid discharge may be destructive to the vitality of the spermatozoa.

Mucous Plug in Os and Cervix Uteri.—The firm, dense mass of mucus which is found so frequently filling the cervical canal and hanging from the os uteri is a mechanical obstacle to the ingress of spermatozoa. It is a result of chronic cervical endometritis, and is removable only with the greatest difficulty. Haussmann found an abundance of spermatozoa entangled in one of these mucus masses. Usually, it is washed away by the menstrual discharge, and conception may occasionally take place when insemination occurs shortly after a menstrual period and before the plug reappears.

Hypertrophied Cervical Rugæ.—Chronic inflammation of the cervix may act injuriously also by producing hypertrophy of the cervical rugæ, and causing an abnormal degree of coaptation of the opposing surfaces.

Deformity of the Uterine Cervix and Labia.—Various malformations of the vaginal portion, involving its length, thickness, shape, and direction, may make impregnation impossible, or at least highly improbable. It may be so greatly hypertrophied in its longitudinal direction as to bring the os uteri almost to or quite beyond the vulva, the fundus of the organ remaining in its proper place. Sterility always accompanies this condition. Or the labia may be wholly absent, the os uteri presenting, instead of a horizontal fissure, a circular orifice situated at the apex of the cervix. This opening is sometimes so small as to be invisible to the naked eye and capable of admitting only the smallest probe. This condition of the os, termed "pinhole," situated at the extremity of a conoidal cervix, is a not infrequent anomaly. Here both the narrowness of the os and the shape of the cervix are causes both of dysmenorrhœa and sterility. A semilunar form of the os is likewise unfavorable to conception.

Another variety of labial deformity is that in which one lip, usually the anterior, projects beyond and overlaps the other. In this condition the os is closed to ingress from the vagina, although no effective obstacle may be offered to the passage of menstrual blood from within outward.

3. Incapacity for Ovulation.

Heretofore, I have considered the conditions which may interfere with the elaboration of capable spermatozoa and their access to the interior of the uterine cavity. Their existence is, with scarcely an exception, ascertainable by touch or sight. There are other circumstances, however, which are equally unfavorable to fecundation, and which are almost entirely beyond our means of investigation, and also

unamenable to curative treatment. I refer to those which prevent the development and separation of a mature ovule and its transmission to the uterine cavity. They include the abnormities of development and the organic and functional diseases of the ovaries and Fallopian tubes. They are not accessible to our sense of sight, and only imperfectly, if at all, to touch. Hence their diagnosis must always be doubtful during life.

The Ovule may not Mature.—It is probable that many ovules escape from the Graafian follicles in an immature state, and are incapable of impregnation. Doubtless, the function of ovulation is more perfectly and more frequently performed in some women than in others. This fact may explain why it is that some women conceive with more or less regularity every fifteen or eighteen months, and others only at intervals of several years; why thousands of sexual connections should be barren, and a single one under apparently similar circumstances be fruitful; and why in some cases pregnancy should occur only after many years of unfruitful married life, the observable conditions being apparently unchanged. We know absolutely nothing of the possible pathological changes in the ovule which may hinder its ripening or render it incapable of fructification.

Disease of the Ovaries.—It is not difficult to understand that any diseased state affecting the nutrition of the ovaries might result in the production of diseased or defective ova, and yet it is not unusual for women whose ovaries are studded with cysts or otherwise diseased to conceive and give birth to healthy children.

Abnormal States of the Blood.—In extreme anæmia conception does not take place, the defective condition of the blood being probably the cause of immaturity of the ova. On the other hand, conception is rare also in women who present undue fatty accumulation, although their blood may be perfectly normal in quality.

Tubercle, Syphilis, Gonorrhœa.—The cachexiæ of tubercle, the poisons of syphilis and gonorrhœa, or great general debility resulting from any other cause likewise have a deleterious effect upon the fecundity of women.

The relations of gonorrhœa to sterility have during late years excited a great deal of interest and provoked much discussion. The extension of the gonorrhœal virus from the vagina to the uterus, and thence to the Fallopian tubes, pelvic peritoneum, and ovaries, inducing inflammation of a most rapid and destructive character in one or more of these organs, is not infrequent. Such a result may take place long after the acute symptoms have subsided and a slight gleet alone remains. These facts have long been known and understood. It remained, however, for Dr. Noeggerath of New York to proclaim a far greater and more widely-reaching significance to an attack of gon-

orrhœa than had been accorded it hitherto. His views concerning the relations sustained by the disease, especially in that which he denominates its latent form, were first published in 1872.[1] The theory advanced by him was so startling, so novel, and the issues involved in its acceptance so important, morally and physically, that it at once challenged the attention of the entire medical world. Briefly, his views were embodied in the following propositions:

"1st. As a rule, gonorrhœa, both in the male and female, persists during the life of the individual, in spite of apparent cure.

"2d. There exists, therefore, a *latent* gonorrhœa in the male as well as the female sex.

"3d. This latent disease, both in the male and female, may cause either a latent or an acute gonorrhœa in a previously healthy person.

"4th. A latent gonorrhœa manifests itself in women in time as acute, chronic, or recurrent perimetritis, an ovaritis, or as a catarrhal affection of the individual parts of the mucous membrane of the genital tract.

"5th. The wives of those men who at any period of their lives have had a gonorrhœa remain, as a rule, sterile.

"6th. Those who may become pregnant either abort or bear only one child. In exceptional cases three or four children may be produced.

"I believe," he says, "I do not go too far when I assert that of every one hundred wives who marry husbands who have previously had gonorrhœa scarcely ten remain healthy: the rest suffer from it or some other of the diseases which it is the task of this paper to describe. And of the ten that are spared we can positively affirm that in some of them, through some accidental cause, the hidden mischief will sooner or later develop itself."

In a subsequent paper[2] Dr. Noeggerath reiterated his opinions concerning the influence of latent gonorrhœa on the fertility of women, adducing additional cases and arguments in their support.

The extreme views of Dr. Noeggerath, especially those which imply the latent character of the disease, have not been generally accepted by the medical profession. While many cases both of acute and chronic inflammatory pelvic disease have an obscure origin, and while it is freely admitted that gonorrhœa in both the acute and chronic stage is capable of giving rise to the various conditions (perimetritis, salpingitis, oöphoritis, etc.) attributed to the latent disease, yet the theory of life-long latency seemed so visionary, so illy sustained by many of the cases cited, and was, above all, so discordant with many well-known facts, that it has failed to enlist very many adherents. That a man who has

[1] *Latent Gonorrhœa in the Female*, by Emil Noeggerath, Bonn, 1872.

[2] *Trans. Amer. Gynecological Society*, vol. i., 1876.

a gleet, however slight, may infect a woman with gonorrhœa is not doubtful. But when all evidences of the disease have disappeared, and have been absent for many years, leaving no trace behind, the case is different, and faith must largely take the place of fact.

The Ovule may not Escape from the Ovary, or may not Reach the Uterine Cavity.—In order that conception may take place it is just as necessary that the ovule should travel outward as that spermatozoa should pass inward. It may be prevented from doing this by thickening of the follicular walls; imbedding of the ovaries in a mass of inflammatory exudation (peri-oöphoritis); closure of the Fallopian tubes; dilatation of the Fallopian tubes (hydrosalpinx, pyosalpinx, hæmatosalpinx); salpingitis; perisalpingitis; peri- and parametritis; pelvic peritonitis; pelvic cellulitis; cohesion of fimbriæ to ovary; closure of uterine opening of tubes by metritis, polypus, or tumor; inability of fimbriæ to reach ovary.

The opportunities for studying *post-mortem* these more hidden of the various abnormal causes of sterility are infrequent—a fact which gives additional value to the report of Winckel[1] based upon an examination of 150 autopsies of women who died between the ages of fifteen and fifty years. Diseases of the ovaries, tubes, and surrounding structures of a character to make conception impossible were so numerous, and so incapable of detection during life, as to throw much doubt as to whether or to what extent an existing sterility may be caused by lesions ascertainable before death. Atresia of both tubes was found in 9 cases; enlarged cervical and corporeal mucous follicles were found in 22 cases, in 7 of which there were also adhesions about the uterus, tubes, ovaries, and rectum; in 2 cases cystic tumors were found in both ovaries; and in 30 cases a single ovary was cystic. In 15 cases conception was impossible from abnormality of the tubes.

4. Incapacity for Gestation.

The Ovule may enter the Uterine Cavity, but fail to find a Suitable Soil for its Attachment and Development.—The mucous membrane which lines the corpus uteri is a highly-organized structure, having for its principal function the furnishing of a suitable nidus for the reception and subsequent growth of the ovum. To do this it must be in a healthy condition. But intra-uterine disease is so frequent that I have come to consider it the commonest of all the causes of sterility. Chronic endometritis, the most frequent abnormal condition, probably acts in a threefold manner: 1, by giving rise to the characteristic profuse gelatinous discharge, and thus hindering the ingress of spermatozoa; 2, by destroying the vitality of the sperma-

[1] *Med.-Chir. Rundschau*, Dec., 1877.

tozoa; 3, by rendering the mucous membrane unfit for the fixation and development of the ovum. Especially by this latter method is it effective.

Inflammatory disease, therefore, while not necessarily or usually a bar to *conception*, prevents fruitfulness by interfering with *gestation*. Impregnation probably occurs much more frequently in these cases than is supposed, but owing to the defect in the nesting and developmental processes it is followed by very early, and generally unrecognized, abortion. And the proper appreciation of this fact will furnish the key to the cure of many otherwise incurable cases of barrenness.

Subjective Symptoms of Sterility.

So far, the causes of sterility which I have enumerated are chiefly anatomical in character and capable of verification either before or after death. But inasmuch as disordered function is always dependent upon structural change—although the latter may be frequently undiscoverable—subjective symptoms, having their apparent or probable origin in the pelvis, should not be ignored in any case under investigation. In the table compiled by Kammerer,[1] out of 408 cases of sterility dysmenorrhœa was noted in 69; menorrhagia and metrorrhagia in 57; scanty menstruation in 41; premature menstruation in 4; menstruation never appeared in 2; menstruation tardy in 8; vaginismus was present in 2; hysteria in 16; nervous headache in 3; intercostal neuralgia in 1.

It is not difficult to understand how some of the foregoing conditions would be likely to entail infertility, independently of their accompanying structural change. Thus, a profuse uterine discharge of any nature may act mechanically by washing away an ovule before or after impregnation. Painful menstruation is frequently—the membranous variety always—accompanied by sterility; not, certainly, because of the pain, but because this is the result in a very great proportion of cases of some obstruction, organic or functional, to the free escape of blood—an obstruction which we can readily believe might, although in a lessened degree, interfere with the ingress of spermatozoa.

The relationship between dysmenorrhœa and sterility has been frequently observed, but whether it is a causal one—and if so, to what degree or in what class of cases—has not been settled. Certainly, the conditions which occasion dysmenorrhœa are not always such as would produce sterility. Kehrer found that a history of painful menstruation before marriage was only slightly more frequent in sterile than in fertile women.

The following table is based upon the study of 72 cases of sterility

[1] *Loc. cit.*

occurring in my own practice, and shows the accompanying, and possibly etiological, conditions present:

Table showing the Abnormal Conditions present in 72 Cases of Sterility in the Female.

Abnormities of the Uterus.	Positional.	Anteversion	3
		Retroversion	7
		Lateroversion	6
		Descensus	10
	Structural.	Anteflexion	16
		Retroflexion	9
		Hypertrophy	17
		Deformed cervix	13
		Fibro-myoma	3
		Polypus	5
		Cancer	3
		Stenosis os externum	8
		Atresia os externum	1
		Stenosis os internum	9
		Stenosis cervical canal	3
		Undeveloped uterus	4
		Small cervix	7
		Chronic corporeal endometritis	17
		Chronic cervical endometritis	23
Extra-uterine.		Ovarian tumor	3
		Chronic pelvic abscess	4
		Adherent displacement of uterus	4
		Tubal distension (?)	2
		Pelvic swellings of doubtful nature	5
		Vaginitis	7
		Chronic cystitis	2
Functional Pelvic Abnormities.		Dysmenorrhœa	16
		Menorrhagia and metrorrhagia	11
		Amenorrhœa	1
		Spamenorrhœa	11
		Tardy menstruation (after 18 years)	3
		Premature climacteric	2
		Dyspareunia	9
		Hysteria	7
		Irritable bladder	12
		Impotence (38 inquiries)	11
		Leucorrhœa	47
Abnormities of External Organs.		Persistent hymen	2
		Cystic labial tumor	1
		Urethral tumor	1
		Vulvitis	3
Abnormities of Nutrition.		Excessive obesity	5
		Anæmia	3
		Secondary syphilis	2
		Tuberculosis	3

Among the foregoing cases there were many which presented complications. Thus, a retroverted uterus would also be enlarged, be the sub-

ject of endometritis and its consequent leucorrhœa, be surrounded by the remains of pelvic inflammation, and possibly be accompanied by still other conditions any one of which might be sufficient to produce sterility. Indeed, it is rather unusual to find a case of barrenness in which only a single detectable cause is present; and even in such a case there is always the possible coexistence of some one of the hidden causes which have been enumerated. (See p. 457.) In 2 of the cases there was a marked growth of hair on the face. In 21 cases the husbands were questioned: 6 confessed to having had gonorrhœa; in 1 of these a single testicle had been inflamed, and in 1 both had been affected. In 4 cases the external organs were examined and found normal in all: 1 of these was aspermatic. In 2 cases there was an admitted history of syphilis: 1 was cured prior to marriage; the other still had occasional mucous patches in the mouth. In the 72 cases examined there was found the following degrees of sterility:

Never had child	59
Had 1 child	9
Had 2 children	3
Had 3 "	1

Diagnosis.—Sterility in a woman is not a definite condition. It is one which exists in different degrees; it may be absolute or relative, temporary or permanent, congenital or acquired, complete or partial.

Sterility is absolute when dependent upon some incurable or uncured condition in the woman which would be efficient under all circumstances; relative, when she is fruitful with one mate and not with another, several examples of this kind having been recorded. It is permanent when the cause is not capable of removal; temporary, when dependent upon some curable local or general condition. It is congenital when produced by some inherent organic defect; acquired, when the deficiency is the result of subsequent accident or disease. A woman is completely sterile when she does not conceive at all; partially or comparatively, when the degree of fruitfulness is less than that of the average of women, either as regards the total number of children produced or the length of time which elapses between their births.

Matthews Duncan quotes from Ansell's tables, which he considers the most complete and reliable, to show that in 6000 cases 3159 children —more than one-half—were born within one year after marriage; 2163 in the second year; 421 in the third; 137 in the fourth; and only 292 were born in all the subsequent fourteen years. Hence sterility may be suspected in a woman who has passed the first year of married life without conceiving, and the presumption grows stronger with each succeeding year, and after the fourth the probabilities of conception are exceedingly small.

According to the deductions of Duncan, based upon the tables of Ansell and his own, the average interval between successive children is twenty months; so that when a married woman does not bear a child every twenty months during the childbearing period she exhibits a degree of relative sterility. These tables show also that the average age of commencing childbearing is twenty-six, and the mean age at the termination thirty-eight years; hence the average period of childbearing is twelve years.

The childbearing period for most women is considerably shorter than that which elapses between the beginning and cessation of the menstrual function, the latter continuing, as a rule, seven or eight years after the former has ceased.

Women who exhibit only a comparative degree of sterility are very numerous, but their unfruitfulness rarely becomes the subject of investigation or treatment. Their condition, therefore, as a class is of more interest to the political economist than to the physician. The women for whom medical aid is likely to be invoked are principally those who have either had no children or who have ceased to produce without apparent reason after bearing one or more. Hence, the diagnosis will consist not so much in determining the existence of barrenness as in ascertaining its cause in any given case. It has already been shown that these are very numerous, and not always apparent. Some, it is true, are obvious enough on the most superficial examination, while others are undiscoverable by the most careful employment of all the means at our disposal. And we should hold always in view the important fact that in a very large number of instances the causes are multiple, and that it is hence necessary, after discovering a probable one, to search for the existence of all possible complications. The methods by which this is to be accomplished cover the entire range of gynecological diagnosis, the details of which do not come properly within the scope of this article.

Order of Investigation.—A case of sterility should be studied systematically. While, as already shown, a majority of women conceive during the first year after marriage, and a very large number during the second, yet in a considerable percentage of cases conception does not occur until the third; so that it may be premature to conclude that a woman is sterile until after the end of three years of married life, and not even then unless it appear that husband and wife are in good general health and the conditions of intercourse favorable.

Statements of the patient may furnish valuable information concerning the degree of regularity, character, and amount of menstrual or other discharges; pain, itching, or other disorders of sensation; the presence or degree of sexual desire or gratification. But these and all other subjective features are suggestive only, and not at all conclusive.

Physical Examination of the Female.—A physical examination of the woman is indispensable. So many of the causes of sterility are of an organic or mechanical character, and detectable only by objective research, that their presence or absence should be determined, if possible, at the outset. The various malformations and diseases of the vulva may be readily detected by inspection and touch. If dyspareunia in any degree be present, its cause or causes should be carefully sought for. The ostium vaginæ and vaginal canal, as regards their size, dilatability, and degree of sensitiveness, should be tested by the careful introduction of first one and then two fingers. The paravaginal structures should be interrogated with reference especially to the existence of swellings and points of tenderness. The vaginal touch should always be supplemented by simultaneous hypogastric pressure. In this manner may be ascertained the condition of the uterus as to size, position, sensibility, and shape; also the condition of the other pelvic structures, including the Fallopian tubes and ovaries. In any doubtful case the recto-abdominal examination should also be employed, since by this method the upper and posterior pelvic contents are brought into closer contact with the finger. To ascertain the source and nature of abnormal discharges an examination by the speculum is necessary. By this means we are also enabled to learn the size of the os uteri, the presence and appearance of erosions, ulcerations, fistulous openings, or other conditions involving alterations of color or character of surface. By the use of the uterine probe or sound we may ascertain the permeability, size, and sensitiveness of the orifices and canal of the cervix.

Such an examination as is here briefly indicated, if carefully conducted, should not fail to detect any condition capable of preventing the access of the semen to the interior of the uterine cavity, and, if it should prove to be negative in results, must eliminate a very large number of the admitted causes of sterility. (See p. 455 *et seq.*)

Examination of the Male.—If, after having proceeded thus far, no apparent cause for the infertility be found, we can no longer assume that the fault is with the woman, although it may still be so, and the next step should be the investigation of the husband. Our inquiries will have reference to the past history and present condition concerning sexual abuse, gonorrhœa, gleet, urethral stricture, orchitis, syphilis, degree of virility, and character of the semen. To obtain knowledge upon these points may require the exercise of a good deal of tact on the part of the physician. Many men prefer not to know—or at least not to have others know—of any sexual deficiency on their part. They are not averse to furnishing information concerning their virile power when this is satisfactory, but not when it is otherwise; and in my own experience there has been on the part of most husbands a very great unwillingness to have their procreative power tested, especially when

the result of the investigation seemed doubtful. In one instance, in which there was uncertainty as to whom the infertility should be ascribed, the husband told me that *after I had treated his wife unsuccessfully for six months he would submit himself to investigation.*

If the male organs be apparently normal in structure and function, an examination of the seminal fluid under the microscope should be made. A single drop is sufficient. The semen should be obtained as soon after emission as possible, and placed under the slide before it has been exposed to a low temperature or other influence known to be inimical to the vitality of the spermatozoa. In this way it may be determined whether any spermatozoa are present, and if so whether they be dead and motionless or alive and active. If spermatozoa be absent or without motion, the man is sterile.

In order to ascertain the influence of the vaginal secretions upon the spermatozoa the interior of the vagina should be exposed by a speculum within an hour or two after coitus, the woman in the mean time retaining the recumbent posture. A portion of the semen may be readily obtained by means of the hypodermic syringe or a small glass tube, pipette, or dropping-tube. The cervical mucus may be obtained in the same manner by previously introducing into the canal a pair of uterine forceps about half an inch and then separating the blades.

If seminal fluid can be traced into the cervical canal, we may usually assume that it will enter the uterine cavity. Nevertheless, it may yet be prevented from doing so by stenosis of the canal higher up, by flexions, polypi, myo-fibromata, etc.; but the existence of these and any other detectable abnormities will, presumably, have already been ascertained.

Hidden Causes of Sterility.—Thus far, the examination will have had reference to the conditions of the spermatozoa, and to those which may interfere with their progress to the interior of the uterus, and at all stages of the investigation there has been a possibility of attaining some degree of definite result. We now come to the consideration of the various obstacles which may exist to the further progress of the spermatozoa toward the ovary, the maturing of the ovule, its dehiscence and transmission to the uterus, and the conditions necessary for its normal implantation and development. Here all is doubtful; speculation must take the place of observation. The organs concerned are beyond our sight and accurate reach. We know, or believe, that certain diseases, deformities, and displacements of the ovaries, Fallopian tubes, and uterus are capable of successfully interfering with ovulation, conception, and gestation; but we cannot with certainty detect their presence or degree during life unless there be enlargement, and not always even then. This seems the more to be regretted in view of the fact that an undeveloped ovary, a contracted, closed, or distended tube,

an inflammatory exudation or adhesion, an endometritis—all undiscoverable by diagnostic procedure—far more certainly determine sterility than does an ovarian cystoma or a tumor of the uterus.

Prognosis.—The prognosis of sterility in any given case must depend upon the nature of the cause and its susceptibility of removal. The most favorable cases are those in which the barrenness is produced by some evident and removable mechanical impediment to the access of the sperm to the cavity of the uterus; as, for example, an unbroken hymen, displacements and flexions of the uterus, stenosis of the os uteri externum, etc. The cases in which essential organs of reproduction are absent or in which there exists irremediable impediment to coitus are manifestly hopeless. Many of the causes of dyspareunia are curable, and in such cases, provided there be no coexisting cause for the sterility, the prognosis is favorable. A history of gonorrhœa in the husband or wife, even though the ordinary symptoms be no longer present, is unfavorable. The prognosis is also bad when no cause is apparent, for this may consist of some of the more hidden conditions, mechanical or physiological, incapable of recognition and unamenable to treatment.

Treatment.—The treatment of sterility is notoriously unsatisfactory. In order to be rational it is clearly necessary that the cause or causes of the condition be ascertained; and it has been already shown how difficult it is in many cases to succeed in doing this, while in others it is impossible. In some cases treatment of any kind will be clearly useless; for example, those in which important organs are absent, imperfectly developed, or incurably deformed, and those in which insurmountable obstacles exist to intercourse or to the transit of semen to the cavity of the uterus. Other conditions which produce inaptitude for germination (non-ovulation), and which prevent the transmission of the ovule to the uterus, are inaccessible and equally incurable.

It is not my province in this article to enter into a detailed account of the treatment of all the various conditions which have been enumerated as causes of sterility. Such details may be found in the systematic books on gynecology, to which and to other portions of this work the reader is referred. Hence what I may say concerning the treatment of the sterile condition will be merely of a suggestive or general character.

No treatment should be attempted *for sterility alone* which involves danger to the life of the woman. The desire for offspring may be strong, and the importance of an heir appear under some circumstances very great, but these considerations should not influence a surgeon to imperil a life by an operation of complaisance which must, even when successfully done, be of doubtful efficacy. Likewise, no dangerous

operative treatment should be undertaken upon the woman unless it shall previously appear beyond reasonable doubt that the fault lies with her and not with her mate. The question presents a different aspect when operative or other treatment is contemplated for the cure of some painful or dangerous complication, as dyspareunia or dysmenorrhœa. Here the comfort and health of the patient are involved, and the removal of the disturbing element may incidentally remove the infertility as well, the latter being, however, a secondary consideration.

Pursuing the order which has been observed in this article, I shall briefly suggest the treatment suitable for the various causal conditions of barrenness in the woman, according as they interfere with insemination, impregnation, ovulation, and gestation.

Treatment of Incapacity for Insemination.—This class of causes includes all those which make coitus impossible, difficult, or painful. (See p. 458 *et seq.*)

Intercourse with a woman is always possible when the vulva and vagina are sufficiently pervious to permit the entrance of the male organ, although the act may be difficult or unbearably painful.

When the sides of the vulva are adherent, partially or wholly, they may be separated by a knife, scissors, or by a combination of cutting and tearing, the opening thus made being maintained by the insertion and retention of some smooth, hard substance in the form of a cylinder or plug to be worn in the vagina until the raw surfaces have become completely healed.

More extensive operations of the same nature are indicated when there is partial or complete closure of the vagina. If any portion of the vaginal tract be completely closed and the uterus and ovaries be present and functionally active, an operation to permit exit of the retained menstrual fluid may be demanded. In cases in which the occlusion and retention have existed for a long time, such changes may have taken place in the internal organs as to constitute incurable causes of infertility.

A double vagina may be remedied by removing the dividing septum by scissors.

A persistent hymen, if perforate, is readily removed or divided with blunt-pointed scissors, one blade being pushed through the opening, the incisions, which should be numerous, being toward the circumference. If imperforate it will call for attention probably before marriage for the symptoms of retention.

Hypertrophy of the clitoris or labia when so great as to be obstructive to intercourse demands amputation. Vulvar or vaginal tumors should be removed.

Treatment of Incapacity for Impregnation.—The conditions comprised under this head are those which prevent the meeting of the spermatozoa

with the ovule. (See p. 455.) They are divisible into two classes, as already stated—namely, those which prevent the semen from passing inward, and those which prevent the ovule from passing outward. Some of these obstructive conditions are successfully treated with more or less difficulty, while others are wholly incurable—or, rather, the sterility dependent upon them is incurable. For example, a distended Fallopian tube or a chronically inflamed ovary may be removed, but the procedure could not, of course, benefit barrenness dependent upon disease of the ablated organ.

When great disproportion exists between the male and female organs it may be proper to make a number of incisions at the circumference of the ostium vaginæ, and follow the operation with the use of a large vaginal plug to be worn for two or three weeks. Otherwise, the condition is irremediable.

Nothing can be done for a congenitally short vagina; the condition persists through life. Painful urethral caruncles and sensitive mucous patches on the vestibule should be excised and their bases cauterized by nitric acid. Fissures of the ostium vaginæ and of the anus are commonly curable by extensive forcible dilatation. Ulcers of the rectum should be treated by appropriate methods, according to the extent and nature of the lesion. Hemorrhoids may be removed by ligature or injection with dilute carbolic acid. Lacerations of the cervix uteri should be closed by operation whenever they produce dyspareunia, impotency, or are sufficiently extensive to permit eversion. Coccyodynia, when merely a neurosis, as it frequently is, may be treated as such, but when dependent upon necrosis of the bone, the latter should be removed. Vaginismus and vulvar hyperæsthesia should be treated by removal of any sensitive remains of the hymen or other painful spots, and subsequent long-continued dilatation. A displaced uterus, if not retained in malposition by adhesions, should be put in proper place and maintained there by means of a suitable pessary, and any accompanying metritis, endometritis, or subinvolution should be treated by appropriate means. Flexions of the uterus may be treated by slow or rapid straightening with bougies having different degrees of curvature—a method sometimes temporarily beneficial—or by the use of intra-uterine stems. If these means fail and the flexion involve only the cervix, the latter may be incised in such a way as to straighten the canal, and thus temporarily remove the impediment to egress of the menstrual discharge and ingress of spermatozoa. A flexion may be remedied sometimes sufficiently to permit conception, but it is very likely to return, sometimes even after parturition.

Many of the deformities, congenital or acquired, of the cervix and os uteri which are productive of sterility are curable by surgical methods, while others are quite unamenable to all the resources of art.

An imperforate os uteri should be treated by making an incision at the proper site and passing into it a sound in order to ascertain the existence and condition of the cervical canal and os internum. If these be found sufficiently patulous, it will only be necessary to enlarge the incision crucially, and maintain its patency by the daily introduction of a bougie. A better method, however, consists in the removal of a conical portion one-third of an inch at the base and extending a half inch or more into the cervical canal. If the os internum and externum be perforate, but with narrow openings, these may be enlarged by dilatation or incision. If the method by dilatation be chosen, it may be done slowly or rapidly. Much controversy has arisen upon this subject, and wide differences of opinion exist as to which is the better method. If we accept all the testimony which has been given in regard to it, we must conclude that all of the different procedures are temporarily successful; that all are followed, sooner or later, by a return of the stenosis; that dysmenorrhœa has been relieved in a large and sterility in a small number of instances; that all are likely in a small percentage of cases to be followed by endometritis, pelvic cellulitis, or peritonitis. My own preference is for rapid dilatation under anæsthesia, and the maintenance of the patency thus obtained by the introduction of a hard-rubber bougie at intervals of three or four days in the beginning, and then of from one to four weeks. The instrument should be carried into, and not beyond, the internal os one or two days before an expected menstrual period.

Hypertrophic elongation of the cervix should be treated by amputation of the redundant tissue with a knife or galvanic cautery. When one of the uterine lips projects beyond the other, overlapping and partly closing the os uteri, the projecting portion should be removed sufficiently to restore the symmetry of the parts.

Fibro-myomata of the uterus should be dealt with quite independently of their influence upon fecundity. If the symptoms produced by their presence should be so grave as to impair health, they should become the object of either palliative or radical treatment, the details of which will depend upon the size and position of the tumor and the age and general condition of the patient. The methods of treatment most relied upon are the administration of ergot, enucleation, removal of the ovaries, and hysterectomy. Manifestly, these methods would some of them only ensure sterility.

Uterine polypi, when productive of hemorrhage, pain, or catarrh, should be removed by torsion, the écraseur, scissors, or galvanocautery.

The dense, viscid, mucous plug which is so constantly present as a result of chronic cervical endometritis may be removed temporarily by means of small pieces of sponge the size of a pea held in the blades of

a forceps. It is frequently a tedious process, however. The menstrual discharge usually washes it away, so that for two or three days after a period very little of it can be seen. In all cases an effort should be made to cure the intracervical disease which causes it—commonly a difficult matter. An essential requisite in the treatment of this obstinate disease is thorough dilatation of the canal in order that the mucus should be permitted to escape so soon as formed, and to enable any therapeutic application to come fairly in contact with the secreting surfaces. The opening should be sufficiently large to permit the introduction of a No. 16 bougie prior to each application. Much of the failure to treat this disease successfully is to be attributed to the omission of this preliminary measure: with it, I have usually succeeded in removing cervical inflammation of very long standing, and am obliged only rarely to resort to the ablation of the glandular structure, although this must sometimes be done.

For excessive acidity of the vaginal mucus an alkaline treatment should be adopted, including alkaline drinks, baths, and vaginal injections. Solutions of bicarbonate of soda, borax, Vichy water (Pajot) are suitable for this purpose. Byasson recommends as an injection the following: Water, 1000 grammes, the white of one egg, and 90 grammes of phosphate of soda. In this solution he was able to keep spermatozoa alive for twelve days. It is probable that the occasional successful results which have attended courses of treatment at alkaline springs and baths have been in this class of cases.

Treatment of Incapacity for Ovulation.—Strictly speaking, the term "ovulation" includes only the processes concerned in the germination, maturation, and dehiscence of the ovule. But for my present purpose I desire to include also its transmission from the ovary to the cavity of the uterus. In this enlarged sense the conditions which may interfere with the series of processes necessary for conception are very numerous. (See p. 461.) So far as these pathological states may affect injuriously the health of the subject, they may interest the surgeon, for many of them are curable by surgical methods, but inasmuch as the cure involves in many cases the removal of the ovaries and Fallopian tubes, the sterility is made absolute. It is true that recovery may take place after repeated attacks of pelvic inflammation, and that lapse of time may, with suitable persistent treatment, bring resolution and absorption of inflammatory exudations; but after the pelvic organs have become solidly matted together with adhesions such recovery must be rare, if, indeed, it ever occurs. Any treatment of the inflammatory affections of the pelvic structures, so far as these relate to the sterile condition, must be made in the earlier stages of the disease in order to be effective.

Treatment of Incapacity for Gestation.—This depends chiefly upon the presence of a diseased condition of the endometrium which pre-

vents productiveness by interfering with fixation and development of the ovum.

When we consider how many of the processes concerned in generation are wholly mechanical, it does not seem surprising that in cases of sterility presenting some apparent obstacle of a physical character this should be promptly accepted as the efficient cause, and that mechanical methods should be resorted to for relief. And it is unquestionable that very many of the conditions which have been mentioned as causes of infertility can be overcome only by surgical means. It is equally true that the mere removal of such obstruction may be, and frequently is, sufficient. But there are many cases in which something more is needed—cases in which operative and mechanical methods do not meet all the requirements. For example, a pronounced flexion of the uterus is a frequent cause of sterility; and clinical experience has seemed to demonstrate that the efficient removal of the distortion and the enlargement of the abnormally small cervical canal have been sometimes followed by conception. Far oftener, however, these means, while promptly relieving the accompanying dysmenorrhœa, have failed to remove the sterility—failed, doubtless, for the reason that they did not remove some other condition than the mere narrowing of the cervical canal, and which was the potent factor in production of the barrenness. And even in those cases in which conception has followed the use of the surgical means for enlarging a narrow cervical canal the fact does not at all prove that the result was a consequence of the mere enlargement of the passage-way; for, whether the operation be done by dilating or cutting instruments, something more is effected than the mere stretching and cutting. Indeed, these procedures make, in addition, a very profound impression not only upon other portions of the uterus than those directly attacked, but one which extends also to neighboring parts. And I do not doubt that long-standing congestions and inflammations which have prevented the uterus from properly receiving and nourishing the ovum have sometimes been thus removed. Further, I believe that it is because the diseased conditions mentioned or similar ones are not always removed by the operations referred to that sterility is not more frequently cured by their employment.

The same may be said of displacements of the uterus, which are thought by many to be the most frequent of all the mechanical causes of sterility. In a paper read before the American Gynecological Society[1] I made the following statement in regard to the relations existing between sterility and uterine displacements: "Of these, retroversion and anteversion form the great bulk, prolapsus being comparatively infrequent, and even when present, not likely, *per se*, to prevent conception. Even the versions of the uterus are not necessarily produc-

[1] *Transactions*, 1879.

tive of infertility. They may constitute a difficulty in the way of impregnation, but nothing more; and they only do this when the os uteri is pressed against the vaginal wall or carried far from its normal position. That these malpositions are, however, sometimes the only causal elements of the sterility is shown clinically by the success which occasionally follows the replacement of the organ and its retention in proper position by means of pessaries. But here too, just as in the case of flexions, these mechanical devices are only exceptionally successful. In the great majority of cases they fail. Why? Because nine-tenths perhaps of all chronic uterine displacements are complicated with chronic uterine disease, which the mere replacement of the organ is inadequate to remove. Practically, it does not matter, so far as the therapeutics of these coexistent conditions are concerned, whether the inflammation or hypertrophy (or whatever the disease may be) or the malposition has appeared first—which is the cause and which the effect. We find them together, and both must be cured. Usually, they must be cured simultaneously if at all; for curing one does not, unless exceptionally, cure the other. And just here we have, as I believe, the fundamental fact which explains why mechanical treatment alone so often fails to remedy the sterile condition. A displacement or a flexion is rectified, perhaps, but an endometritis which coexists, and which is the potent factor of causation, is not removed, and the sterility remains. Not only this: from the persistence of the inflammation the displacement or deformity itself is likely to return. Hence, while we cannot discard the pessary, and while by its use great amelioration of the patient's symptoms may be effected, and while, still further, the mere replacement of the uterus may sometimes be sufficient to restore the organ to a healthy state, we cannot rely upon this latter result. So, when sterility complicates displacement we must expect to find disease also, and this latter, as well as the malposition, must be removed if we would cure the barren condition."

In cases of sterility attended by inflammatory disease of the pelvic organs too much stress cannot be put upon the importance of sexual repose. This can frequently only be obtained by separation of husband and wife.

It has been generally thought that conception is much more likely to occur within a few days subsequent to a menstrual period. This belief was based upon the theory which regarded menstruation only as dependent upon, and an epiphenomenon of, ovulation—a theory so inconsistent with many now admitted facts as to be no longer held by some, and very loosely by others. Fecundation may result from a coitus had at any time between two menstrual epochs, the essential requisite being the junction of the ovule and spermatozoa. Nevertheless, it is still true that the most favorable period for the occurrence of conception is

within the first eight or ten days after the cessation of a menstrual flow, because the increased congestion of all the pelvic organs during the catamenial fluxion occasionally determines the more hasty rupture of a mature follicle.

Artificial Impregnation.

In certain cases of sterility it may be proper to attempt artificial impregnation. This consists in the mechanical introduction of spermatic fluid into the uterine cavity. The cases which are especially adapted to this method of treatment are those in which there is some obstacle to the passage of the spermatoza from the vagina to the interior of the uterus, as occurs in flexions of the neck on the body of the organ and stenosis of the cervical canal.

Prior to resorting to this method it should be certainly known that the husband is fecund, as indicated by a normal condition of the semen; that the menstrual function is properly performed; that the pelvic and genital organs of the female are normal; that all other rational methods of treatment have failed. In every case the consent of both husband and wife should be obtained.

The attempt having been decided upon, coitus is practised in the ordinary manner. Subsequently, within one or two hours, the woman having in the mean time maintained the recumbent posture, a small quantity of the semen in the vagina is drawn into a properly-constructed syringe which has been previously warmed to the temperature of the body. The tip of the instrument is then carried through the cervical canal to a point just beyond the os internum, when a single drop is forced forward by a partial turn of the piston. The tube is held quietly in the cervix for a few seconds, and then carefully withdrawn. The woman should lie in bed several hours immediately following the operation. Girault[1] prefers to the syringe a hollow sound for the introduction of the semen. The instrument, properly charged, is placed within the neck of the uterus, and the fluid is discharged by blowing through the tube with the mouth of the operator.

The degree of success which has attended the method of artificial impregnation is not known. During the year 1866 the late Dr. Marion Sims made 55 experiments on 6 different women. Many of the operations were imperfectly done or performed under unfavorable circumstances. In a single instance conception occurred, but even this was inconclusive, since the experiment was preceded and followed by ordinary cohabitation. Girault[2] has had eight successes, one a twin pregnancy; the number of experiments not given. De Sinéty[3] says:

[1] *Étude sur la Génération artificielle dans l'Espèce humaine*, Paris, 1869.
[2] *Loc. cit.*
[3] *Manuel de Gynécologie*, 1879.

"The successes obtained after eight or ten futile attempts are an encouragement for the repetition of this manœuvre a certain number of times." Richard[1] states that Gigon, Lessueur, Delaporte, and other French physicians have also been successful in artificial fecundation, but does not give details.

Artificial impregnation has never become popular with the medical profession, notwithstanding the great scientific interest which attaches to the subject. Many have condemned the practice without, it seems to me, any very good reason. It aims to accomplish by comparatively harmless means an end which all gynecologists are willing to attain by more dangerous methods, for surely no one can claim for the various remedies in vogue for overcoming flexions and stenosis of the cervix uteri a degree of safety at all comparable with that used in artificial impregnation. Objections which have been sometimes urged on merely ethical grounds may very properly be left for the disposal of the parties chiefly interested—namely, the husband and wife.

Eustache[2] says: "This last intervention—*ultima ratio*—is not condemned by either morality or religion; it is justified by the essentially legitimate and essentially moral desire to have children, and also by a certain number of incontestable successes."

[1] *Histoire de la Génération*, p. 255.

[2] *Manuel pratique des Maladies des Femmes*, 1881, p. 732.

DISEASES OF THE VULVA.

By MATTHEW D. MANN, A. M., M. D.,

Buffalo, N. Y.

Malformations of the Vulva.

As the congenital malformations of the vulva have been already fully described,[1] it is only necessary to say here a few words concerning their treatment, so far as that may be required.

Hypospadias and *Epispadias* are virtually incurable defects, but the discomfort and annoyance can sometimes be materially diminished by carefully devised plastic operations. Where the anterior wall of the urethra is wanting, even when the defect extends entirely through the mons Veneris, flaps can be obtained from the sides and the parts brought together, so as materially to better the patient's condition, and even give retention of urine. Schroeder[2] reports two successes where these conditions existed. In hypospadias the chances of success are much less, and the patient is reduced to the necessity of wearing a urinal. Several have been devised for these cases expressly.

In *hermaphrodism* no special treatment or operation is indicated.

The *clitoris*, if greatly enlarged, and the source of discomfort, may with safety be amputated. Mason[3] successfully amputated with the écraseur a clitoris four inches long.

The *labia minora* are sometimes very large, but they seldom cause any inconvenience. In those cases in which there is a supersensitive condition of these organs, Carrard[4] has "very recently been able to show that the cause is an increase of their nerve-fibres in the form of Meissner's tactile bodies, also in the form of club-shaped terminations and peculiar tactile bodies having an aggregation of adenoid tissue." If such conditions exist, they are of course incurable, and can only be relieved by the total excision of the affected organs. In other cases there is simply chafing from clothing, or, in very stout women, from

[1] See article on Malformations of the Female Genitals, p. 264.

[2] *Lehrbuch d. Gyn.*, v. Aufl. [3] *New York Medical Review*, May 1, 1868.

[4] Quoted by Winckel from *Zeitschrift f. Geburtsh.*, x. 62.

contact with surrounding parts. The result is more or less burning and itching, which produce a great deal of discomfort, and may interfere with locomotion or the sexual act.

These symptoms may be relieved by hot baths, astringent lotions, ointments, or dry powders, as talc, bismuth, and boric acid. If, however, the symptoms persistently recur, removal of the parts may be indicated. The operation is a simple one, and can be done with knife or scissors, and the edges brought together with fine continuous suture. If hemorrhage is feared, the cautery-knife may be used.

Masturbation, it has been asserted, sometimes results in hypertrophy of the nymphæ, and even of the clitoris. To this many objections, based on accurate observations, have been made. The worst case of masturbation I ever saw, presented abnormally small clitoris and nymphæ, and I have several times seen well-marked hypertrophy where the most positive assurances made the existence of this habit out of the question. On the other hand, there is good ground for thinking that unilateral hypertrophy of the nymphæ may result from long continuance of the habit. A number of cases bearing on this point have been reported;[1] and while it can by no means be considered as pathognomonic, still its presence must give rise to a very strong suspicion. It is noted that in the case of right-handed women the right labium is enlarged, and in the left-handed the reverse occurs.

As additional points in the diagnosis of masturbation, Dr. Routh and Dr. Heywood mention[2] that they have observed that in women guilty of this practice the pudendal hair is straight. Dr. Heywood has also noticed that in many cases the nymphæ were not only lengthened, but granular on their external aspect, and had flattened follicles filled with sebaceous matter. This condition of the labia may perhaps be a cause rather than a result of masturbation, the continual local irritation directing the woman's attention to the parts. I have seen it exist without any signs of the practice.

The operation of removing the clitoris and nymphæ for the cure of masturbation and nymphomania was at one time much practised; but after a very bitter controversy, which makes one of the most unhappy episodes in gynecological history, it was condemned, and has been almost entirely given up.

Atresia may be either congenital, or acquired during infancy or childhood. It is very rarely met with. In the acquired form agglutination of the labia takes place as the result of inflammation or ulceration. In either case, when discovered, the adherent surfaces should be torn or dissected apart, and the raw surfaces kept from again uniting by pledgets of lints placed between them.

[1] *British Gynecological Journal,* Feb., 1887, p. 503.

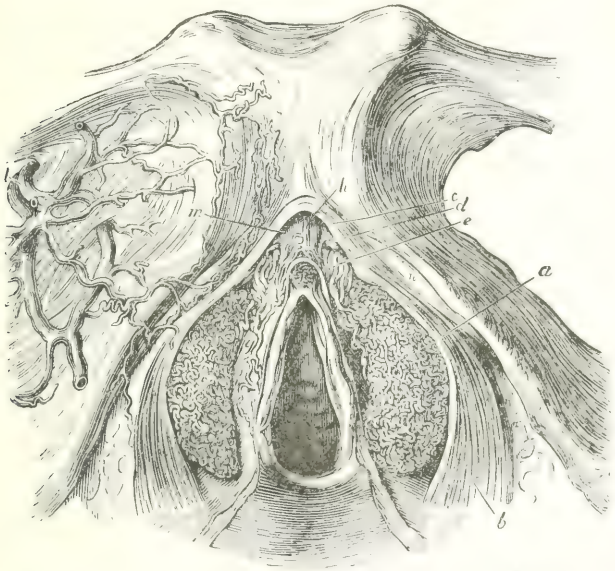
[2] *Brit. Gyn. Journ., loc. cit.,* p. 505.

Injuries and Wounds of the Vulva.

Injuries of the vulva may be divided into three classes, according to their cause: they may be produced by accidental external violence, during coitus, and during labor.

Wounds due to Accidental External Violence.—The genital organs are so well protected by their location that accidental wounds are necessarily rare. The most common accident is a fall on some sharp body, which may thus bruise, cut, or penetrate the part. Wounds of this description are also met with among the lower classes from kicks with heavy boots. In this case the vulva may be only bruised; or, should the tissues be caught between the boot and the

Fig. 176.



Veins of the Vulva (Kobelt): *a*, bulb of the vagina; *h*, dorsal vein of the clitoris; *e*, intermediary plexus; *g*, vein of communication with the obturator vein; *l*, obturator vein.

pubes, a wound, almost as clean-cut as though made by a knife, may be made. The labia majora are the parts most generally injured; but the deeper parts may also be affected, and, although not cut through at once, may slough subsequently. In this way the nymphæ and clitoris may be injured, and even a portion of the urethra lost. The nature of the wound due to a fall must depend entirely on the object inflicting the injury. If the person fall, for example, on the sharp back of a chair or the edge of a box, a deep cut may be made. Should the object be smaller, it may enter the vagina and cut or penetrate its walls.

The symptoms are pain and hemorrhage if the skin has been broken, soon followed by swelling, and later in some instances by sloughing. In case the skin is not broken, but the deeper and softer tissues ruptured, a rapid effusion of blood may take place into the tissues, forming a large tumor known as a pudendal hæmatoma.

If the deeper structures, as well as the skin, are opened, a very profuse hemorrhage will follow. This will be particularly severe in case of the rupture of the large veins (Fig. 176) in the neighborhood of the clitoris and nymphæ. These veins, being valveless and very large, allow of a rapid loss of blood. If the vagina be penetrated, any of the surrounding organs may be wounded and inflammation follow.

Injuries from Coitus.—It is certainly a very strange circumstance that sexual intercourse is sometimes attended with severe, and even dangerous, laceration not only of the hymen, but of the vulva and vagina as well. The possibility of this has been doubted by some high authorities, but the evidence seems too strong to be denied. Sir Spencer Wells, Mundé, Chadwick, Schroeder, and others[1] have reported cases where this accident has undoubtedly happened. In some instances the extent of the injuries makes it seem almost impossible that the finger or some other instrument was not used. Rents have been recorded of the hymen and vestibule; of the fossa navicularis, extending into the rectum, making a vulvo-rectal fistula; of the anterior vaginal wall, making a vesico-vaginal fistula; and of the posterior wall, making a recto-vaginal fistula.

The causes noted have been extreme violence in the sexual act, excessive disproportion between the male and female organs, narrowness of the vagina, as in very young and very old women, and unnatural positions in coitus.

The symptoms have been extreme pain during coitus, and hemorrhage, sometimes of an alarming kind. The flow is especially free if the bulb of the vagina is torn. Permanent fistulæ have been observed to follow these lacerations (Price, Wells, and others).

Injuries during Parturition.—The discussion of these injuries belongs more properly to writers on obstetrics. Their prevention can only be achieved by a proper management of the second stage of labor, and even with the greatest exercise of skill is not always possible. Their immediate treatment seldom falls to the gynecologist, but the secondary operations make up a considerable share of his surgical work. This subject will be treated of in a separate article.

Treatment.—The treatment in all the above cases, except those due to labor, must vary with the severity and nature of the injury. If it be a simple bruise of the labia, cold applications and rest will be all that is required. If there be deep cuts, they should be carefully

[1] *Am. Journ. Obstetrics*, vol. xix. p. 832.

cleansed with an antiseptic solution, all torn bits of tissue trimmed off, and the edges, as well as the deeper parts, brought together with sutures if possible. Drainage-tubes will seldom be required. If violent hemorrhage be present, deep sutures are generally the best method of controlling it, all large arteries having been first carefully twisted, or tied with catgut. As the hemorrhage is, as a rule, mostly venous, if the sutures do not control it, firm pressure by a compress and a T bandage will usually suffice.

When we have to deal with a deep penetrating wound of the vagina, if the hemorrhage be severe, a careful examination of the wound through a speculum should first be made, sutures applied if necessary, or the vagina may be securely tamponed. The tampon can be moistened with alum-water and freely sprinkled with iodoform, in which case it may be safely left in place for four or five days, without fear of decomposition and consequent sepsis. If the perineum be torn, it may be closed by sutures at once, as in the ordinary secondary operation. If the injury is confined to the hymen or to more superficial parts, a tampon may be applied to fill the vagina, before making compression with a pad and a T bandage.

Where operations for the closure of wounds of the vulva are undertaken, even in very unpromising cases, careful antisepsis, such as washing with carbolic or sublimate solutions, with the free use of iodoform, aided by the naturally high vascularity of the parts, will generally secure primary union.

In the case of young children, all defects due to injuries, old or recent, should, if possible, be repaired before puberty, as it can scarcely be doubted that the subsequent regular development of the parts will go on more naturally.

As regards the injuries due to childbearing, professional opinion is pretty well agreed, that the primary operation is, in any but the most trivial cases, the proper treatment. In the lesser degrees of laceration the writer has a number of times seen most excellent results from the use of the serres-fines.[1]

Where the laceration extends through the sphincter ani and up the recto-vaginal septum, the advisability of the immediate operation is not so generally conceded. The writer would give it as his opinion, after some very fortunate results, that an operation is not only possible, but is strongly indicated. The use of antiseptics makes danger from imprisoned fetid lochia a purely preventable danger, and one which should not contraindicate the operation. If union occurs, the patient is saved from a great deal of suffering; and if it fails, the success of a secondary operation is in no way interfered with. Alloway's method[2] has in my hands proved satisfactory, not only in the lesser degrees of laceration,

[1] *Am. Journ. Obstet.*, Nov., 1874.

[2] *Am. Journ. Obstet.*, vol. xvii. p. 380.

but even where the sphincter has been torn. Permanent fistulæ, due to accidents or coitus, are to be treated in the same way as those due to labor.

Hernia.

Women are liable to the same forms of hernia that are found in men. Many of them resemble exactly, in symptomatology and treatment, those found in the male, while others are changed in some particulars by the different anatomical conditions existing in the two sexes. But besides those which they have in common with men, women are subject to certain peculiar distinct varieties.

The varieties which are peculiar to women, or are materially modified by the anatomy of the female pelvis, are—

1. Inguinal or suprapubic hernia.
2. Elytrocele, or vaginal hernia.
3. Pudendal hernia.
4. Cystocele, or hernia of the bladder.
5. Rectocele, or hernia of the rectum.
6. Perineocele, or perineal hernia.

1. Inguinal Hernia (Anterior Labial Hernia, Episiocele). —Portions of the abdominal contents may come down through the abdominal ring into the labium majus in the female, in a manner exactly analogous to scrotal hernia in the male. The treatment is practically the same, whether by truss or radical operation; but the diagnosis presents some peculiar features. Early in its descent the hernia makes a small tumor in the region of the external abdominal ring. It gradually pushes its way down into the labium majus, where it makes a swelling of the part. Such a hernia may occur on one side alone, or there may be one on each side at the same time.

Diagnosis.—Early in its career, a hernia is liable to be confounded with diseases of the round ligament, or accumulations in the canal of Nuck. Later on it may be mistaken for cysts or abscesses in the labium, cyst or abscess of the recto-vaginal gland, and tumors in the labia. It must not be forgotten, that the ovary may make a part of the contents of the hernial sac, giving it a density and a painful character entirely unlike other forms of hernia. Hernia of the ovary is often congenital. The uterus has been found to make up the contents of a hernial sac; and, pregnancy occurring, laparo-hysterotomy was necessary to accomplish delivery. Two such cases are quoted by Winckel. A careful attention to the general rules for diagnosing hernia will serve to distinguish it from the diseases mentioned.

Inguinal, as well as umbilical herniæ, are not uncommon complications of ovarian and other abdominal tumors. Advantage may be taken of an ovariotomy or other abdominal section to cut out the ring.

in the case of an abdominal rupture, or to unite the edges of the ring with catgut suture after freshening its edges. The dangers of the major operation are not thus materially increased. The writer has followed this practice in several instances with satisfactory results.[1]

2. Vaginal Hernia (Vaginal Enterocele, Coleocele, or Elytrocele).—A vaginal hernia may be defined to be the extrusion of a portion of the abdominal contents through an opening in the muscular coats of the vaginal walls, the peritoneal and mucous membranes remaining intact and covering the hernia. The existence of a distinct rupture in the muscular coat is doubted by some, and there is no post-mortem record to prove it; but in several reported cases, the presence of a distinct ring in the vaginal wall, with only a thin covering to the protruding gut, would seem to point very decidedly to the existence of such a rupture, in some cases at least.

Cause.—The cause is sometimes a sudden fall or jar of the body, or some great muscular effort, such as lifting, or straining at stool. Probably the most frequent causes are pregnancy and parturition. The physiological softening of the tissue which takes place at this time predisposes to the rupture, and is aided by the increased pressure on the pelvic floor, and the still greater increase of intra-abdominal pressure during the pains, especially if the labor be long and severe. Sir Astley Cooper believed that the reason of the comparative rarity of this form of hernia is that the oblique portion of the pelvis is unfavorable to its production. In the erect, as well as in the sitting posture, the intestines fall rather upon the symphysis pubis than upon the uterus and the parts behind it. The uterus is then pushed toward the rectum, and Douglas's cul-de-sac closed. Were the intestine commonly found filling the cul-de-sac, undoubtedly this form of hernia would be much more common.

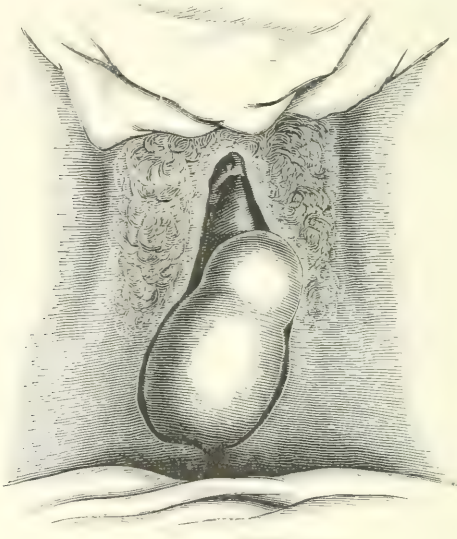
The situation of the ring or opening is usually behind the uterus; but cases have been described where it was lateral, or even anterior to the uterus. These latter cases greatly resemble pudendal hernia. A case which recently occurred in the practice of Dr. W. H. Heath of Buffalo was of this nature (Fig. 177). The hernia came down in front of the uterus, which was retroverted, pushing the vaginal walls before it until it presented a considerable tumor at the vulva. The mass was easily reduced, and I succeeded in retaining it in place by a Hofmann's pessary.

Symptoms.—The symptoms are, when the hernia occurs suddenly, a sense of something giving way, followed by pain and a feeling of fulness in the vagina. The pain may be intense and alarming, or very slight at first. When the trouble develops slowly, there will be more

[1] For a fuller consideration of those classes which resemble those found in the male, the reader is referred to the works on general surgery.

or less interference with locomotion, pain on coitus, bearing-down and often colicky pains, with constipation. In one case (Barker) there were numerous attacks of sudden and severe pain with all the symptoms of peritonitis, evidently due to some spasmodic contraction at the neck of the sac. The pain yielded to morphine and other treatment, and the

FIG. 177.



Anterior Vaginal Hernia.

patient made a good recovery. The function of the bowel is often interfered with, though no case of actual strangulation has come to my knowledge. Thomas has pointed out that it may occur, as a result of pressure in labor, from inflammation, fecal impaction, torsion of the contents of the sac, or the presence of a tumor.

During labor the pain caused by the presence of the gut in advance of the fetal head may be sufficient to stop the labor, and be accompanied with all the symptoms of shock. There will then be found a characteristic tumor in the vagina, or such a tumor may appear at the vulva.

Diagnosis.—The diagnosis must depend on finding the hernial protrusion within the vagina, or outside the vulva. It must be differentiated from tumors of the uterus and vaginal wall, solid, cystic, or gaseous. From solid tumors it could be distinguished by its consistency, the hernia being soft and yielding. The presence of an enlarged ovary or small pedunculated fibroid in the sac, might greatly increase the difficulties of the diagnosis. The peculiar characteristic would be the ability to reduce it, especially with the patient in the knee-chest posi-

tion. There would also be impulse on coughing and increase of the tumor on straining. Intestine in the sac might give a sense of gurgling to the touch and resonance on percussion, though it is to be remembered that gas and fluid are by no means constantly found in the small intestine.

The tumor is usually pear-shaped, growing smaller upward, thus resembling a polypus. It may reach the size of a fœtal head at the very outset, though generally quite small. It must be remembered that the sac may contain, besides intestine, omentum and fluid. One case[1] is reported where the tumor was mistaken for a polypus and removed, with, of course, fatal results. To make sure that it is not a prolapse of the rectum through the vaginal wall, the rectum may be filled with water, or a combined vaginal and rectal examination made. The edge of the hernial sac or the ring is sometimes to be distinctly felt, but, when recent, or before induration has taken place, is not always discoverable.

The aspirator needle might afford valuable confirmation in cases of doubt. Should the urinary bladder make part of the hernia, imperfect emptying might lead to cystitis. In this case, examination by the sound or finger through the urethra would be indicated, if doubt should exist.

Treatment.—In the way of treatment the first thing is, of course, to reduce the rupture. This may be done by taxis, and will be greatly aided by putting the patient in the knee-chest position. Should this fail and the symptoms be urgent, the whole hand might be introduced into the rectum and the mass pulled back through the opening. There is, however, as has been already explained, little danger of strangulation. The pain in the acute cases may be relieved by morphine, or, if severe enough to warrant it, by inhalations of chloroform. If it occur or is found to exist during labor, the intestines must be reduced, and held back by the hand, until the presenting part has passed the point of escape. If this be impossible, the labor should be expedited by forceps or rapid extraction. After the reduction of the rupture in the non-pregnant condition, an effort must be made to hold it up by a pessary or supporter of some kind. A sponge has been used with success, the patient introducing it before rising in the morning. No rule can be given as to the sort of pessary to be used, as this must depend entirely on the situation of the ring. If the opening be high behind the uterus in the posterior fornix, a permanent cure might be effected by obliterating the fornix by a plastic operation, uniting the posterior wall of the cervix with the posterior wall of the vagina to a point below the opening, great care being taken not to open into the peritoneal cavity while denuding the tissue. Should relief be unattainable in any other way, the sac might be opened and the edges of the ring, if there be any, united by suture. If done with proper precautions, the danger would be but slight.

[1] *Centralblatt f. Gyn.*, vol. iii. p. 103.

Dr. Thomas proposed[1] and successfully carried out a novel plan in the case of a large hernia which was causing the patient very great distress. He made an abdominal section, and after emptying the sac and inverting it, pulled it up and fastened it to the abdominal wound, sustaining it by two needles, in the same way that the stump is held up in hysterectomy. He found a large, soft, subperitoneal fibroid tumor of the pelvic connective tissue which had made part of the contents of the sac. This was removed at the same time.

In cases occurring during labor, a prolonged and unremitting observance of the recumbent posture during convalescence, has several times been found to be all-sufficient to effect a permanent cure.

3. Pudendal Hernia (Hernia Labialis Posterior, Hernia Vagino-labialis).—These names are given to that form of hernia, in which the rupture appears in the posterior part of the labium majus. The escaping portion of the abdominal contents makes its way in front of the uterus, alongside the vagina and bladder, and between them and the levator ani muscle, through the pelvic fascia, and finally, passing through the pelvic outlet, enters the lower portion of the labium majus, where it presents as an elastic swelling. The course of the hernia is just along the ascending ramus of the ischium.

This form of hernia is rare, but seems to be more common than true vaginal hernia. The sac usually contains small intestine; but the large intestine and omentum may be present in it, and in a case described by Hodgen there was a large accumulation of fluid. The size of the tumor is not usually great—as large as a pigeon's egg—but in Hodgen's case the mass weighed ninety-four pounds. In shape the hernia is pyriform. It usually increases gradually in size, and does not bear so constant a relation to pregnancy as the vaginal form, though the relationship is retained to a degree. There is little or no pain accompanying it unless it reaches a great size. The escaping gut is usually easily reducible, and often goes back when the patient reclines. It enlarges on coughing and bearing down.

Diagnosis.—This form of hernia is differentiated from an inguinal hernia which has descended into the labium by its position, being much farther back. On following up the hernia as it returns into the peritoneal cavity, the finger will pass into the vagina. The upper part of the labium and the external abdominal ring are free, and pressure made on this point will not hinder recurrence of the tumor. As regards its diagnosis from other tumors and enlargements, the same rules apply, which decide us in any form of hernia. It may be mistaken for a hydrocele of the round ligament, new growths in the labium, and for hæmatoma and abscess of the vulvo-vaginal glands. In both cases the history, together with the position of the enlargement, its persistence

[1] *N. Y. Med. Journ.*, Dec. 26, 1885.

under manipulation, and the absence of the usual signs of hernia, may be relied upon. Unquestionably, the greatest danger, as Thomas points out, is in forgetting the possibility of hernia in this position, and drawing deductions without considering it. The results of such a mistake might perhaps be disastrous.

Treatment.—The treatment of this hernia is essentially difficult. As in vaginal hernia, a pessary worn in the vagina may be sufficient to retain the intestine in place, but many obstacles stand in the way of success. A truss properly adjusted, or a T bandage, may be sufficient. In every case an effort should be made to support the hernia, as it may become greatly enlarged, and produce serious trouble or even death (Hodgen). There are, apparently, no cases of irreducible hernia of this class, though symptoms of strangulation may occur. Taxis, aided by the knee-chest position, will probably cause the mass to return in every case. There is little chance of a cure by radical operative measures; as the exact situation of the neck of the sac would be hard to determine, and would probably be too high to be easily reached, except by laparotomy. Thomas's operation might be applicable to a case of this kind, should the symptoms warrant it. In a case observed and described by Winckel,[1] he succeeded in holding up the hernia by first freshening the periphery of the surface over the rupture for about 1.5 cm., and reinverting this portion by sutures. After union had taken place the thinned and dilated skin was much thicker, contracted, and more resistant; and a carefully applied truss, which before was useless, now gave a good result. A truss made on the plan of a T bandage, with an upright, holding a pad or cup-shaped support, would seem most likely to succeed.

4. Cystocele (Hernia of the Bladder).—This consists of a prolapse of the anterior wall of the vagina, carrying with it the closely-attached bladder. It is usually due to some lesion of the pelvic floor in childbirth.[2]

5. Rectocele (Hernia of the Rectum).—This is a condition affecting the posterior wall of the vagina and rectum, analogous to cystocele.[3]

6. Perineal Hernia (Perineocele).—Many writers describe a form of hernia in which the intestines make their way first into Douglas's cul-de-sac, and then force a passage through the perineum between the vagina and rectum, appearing as a tumor near the anus. In the male such a hernia is doubtless possible; but, after a careful examination of all the accessible literature on the subject, I am convinced, that in the female, such a hernia is impossible and never existed. The testimony

[1] *Pathol. d. Weibl. Sex. Org.*, 1881, p. 282.

[2] For full description see article on the Vagina, Vol. II.

[3] See articles on the Perineum, Vol. II.

of the older writers must be thrown out, as they did not sufficiently distinguish a rectocele with ruptured perineum, cystocele, etc. Many of the cases are too imperfectly described, and some of them were not true perineal hernia, but simply a prolapse of the intestine into Douglas's pouch. Pirogoff has described a case (see article on Anatomy) in which this pouch descended to the floor of the pelvis, between the whole length of the vagina and the rectum. Supposing such a condition, and a displacement of the uterus toward the symphysis pubis so that the entrance to the pouch is brought well forward, a prolapse of the intestines might readily follow. But that the perineum could be penetrated by the descending gut is hardly possible, considering its dense structure and the soft and easily displaced vaginal and rectal walls, by which it is confined before and behind. The point of least resistance would be through the vulvar opening, displacing the vaginal wall and the perineum before it. No modern authority, with whom I am familiar, has seen and reported a case, and the later medical journals have been searched in vain. The term "perineal hernia" has been applied to the condition which is here described as pudendal hernia, and this is one source of confusion and error. Since writing the above I have had access to Winckel's splendid work on the pathology of the female organs, and he takes much the same ground as is here taken against the existence of such a rupture, and considers that it is certainly not proved.

Prolapse of the intestine into an unusually deep Douglas's pouch is very rare. It may give rise when it occurs to many disagreeable symptoms, such as fulness, constipation, and colicky pain. It may be easily recognized by conjoint examination in the vagina and rectum. The intestine is easily replaced, and may be kept in place by a retroversion pessary—one with a large bulbous extremity best filling the space and keeping the intestine in place. A patient wearing a pessary for such a condition, should be cautioned against a possible strangulation by the intestine slipping by the pessary and being unduly pressed upon.

Hydrocele (H. muliebris, Cyst of the Round Ligament).

These terms are applied to a collection of fluid in the canal of Nuck. The condition is a very rare one; and until quite recently the literature of the subject has been very scanty, Hart, Thomas, Wile, and Hennig being among the first to draw attention to it. Many of the textbooks are silent on the subject. About fifty cases in all have been so far described.

The canal of Nuck is usually obliterated before birth, but occasionally the whole or a part may remain open. If the whole is open, affording a connection with the abdominal cavity, the result may be the

escape into it of some of the abdominal contents, either intestinal or fluid. If only a part remains open, the opening at the ring being closed, the membrane may take on a secretory action, resulting in the formation of a cyst. The cause of this condition is little understood. Traumatism, pregnancy, and labor have been thought in a few cases to have had some share in its production, but in the majority of cases no cause has been assigned. The fluid is usually of a pale straw color, containing albumen, salts, and epithelial cells, and occasionally blood. Rarely, pus and gas are found as the result of inflammation, or septic inoculation of the cyst.

This disease has been found in all periods of life, from two to seventy-one years. It is rather more common on the right side than on the left, and in a few instances both sides have been affected.

Symptoms.—The clinical history of the disease is very short. It usually begins as a painless swelling in the neighborhood of the external abdominal ring. This swelling grows slowly, and gives little inconvenience until it reaches considerable size.[1] It may finally enlarge to the size of a child's head, or may never exceed that of a marble. Dyspareunia, sterility, and interference with locomotion, as well as reflex nervous symptoms, may be the only results. In a few instances inflammation has resulted either from surgical interference or from too great expansion of the sac. Erysipelas has several times followed operative procedures.

Diagnosis.—The diagnosis should not be difficult except in certain complicated cases, and yet the mistake has frequently been made of confounding it with a rupture, particularly with strangulated hernia. The situation of the tumor, just below the abdominal ring, or in the labium majus, if large, might lead to such a mistake; but the history of the case, its long duration (years in many cases), the fact that it cannot be and never has been reducible, absence of impulse in coughing, and, finally the light test, as in hydrocele in men,—may serve to distinguish it in uncomplicated cases. The peculiar feel of water in a tense sac, should serve as an aid to the experienced touch, and would be quite different from that presented by intestine or omentum in a hernial sac. In cases complicated by inflammation, where the cyst contains pus or blood and gas, the diagnosis will be more difficult. It is not to be forgotten also that a hydrocele and a hernia may coexist. In doubtful cases puncture with an aspirator-needle is not only safe, but necessary for the establishment of a certain diagnosis. To distinguish a bad case, with fever and vomiting, from strangulated hernia, the absence of obstipation should be conclusive. To diagnose this disease from cysts in other parts of the labia is difficult, but, fortunately, of little practical moment, as the treatment would be the same in any case.

[1] See case of Dr. Baker, p. 535.

Treatment.—The treatment must be varied according to the case. If the fluid can be returned to the abdominal cavity by taxis, this should be done, and the pressure of a truss may then suffice to cause adhesive inflammation, and obliteration of the sac. In case the fluid is encysted, simple puncture may be enough to effect a cure, but usually something more is required. If, after evacuation, an irritant is injected into the sac, inflammation will be set up and a cure effected. For this purpose a few drops of tincture of iodine or carbolic acid have been successfully used. In other cases it has been found better to lay the whole sac open, pack it with lint, and allow it to granulate and heal from the bottom. In case of suppuration of the sac, a free incision and packing with lint and iodoform, or some similar antiseptic, is certainly indicated. Hening cured one case with an iron wire, carried through the cyst and left for some time. After simple evacuation care should be taken not to manipulate the parts too much, so as to set up inflammation and suppuration. Perfect rest for a day or two, with moderate pressure from a compress and bandage, should be the after-treatment. In this disease, as in several other affections of the vulva, the greatest danger, unquestionably, lies in a wrong diagnosis and consequent improper treatment.

Vulvitis (Inflammation of the Vulva).

There are five forms of vulvitis described—viz. the simple, gonorrhœal, follicular, diphtheritic, and phlegmonous.

Simple Vulvitis.—Acute catarrhal vulvitis, except in a very mild form, is a rare disease in the adult; among children it is quite common. Nearly all cases met with among women can be safely classed under the head of specific disease. In a subacute or chronic form it is more common. When acute and non-specific, it is generally confined to the vulva alone, and does not involve the vagina.

The causes of the acute form are injuries and operations, awkward and immoderate coitus, irritating discharges, and want of cleanliness.

The first symptoms are heat, burning, and moderate swelling of the parts, with redness and pain, especially on motion. This is followed by a free secretion of muco-pus, which continues for a time, with an abatement of the symptoms.

The course of the disease is usually self-limited, but may run into the chronic form. It has been asserted (Bedford) that this disease is contagious; but of this we have no proof, and, until we learn more certain ways of distinguishing this disease from gonorrhœa, we can neither deny nor confirm the assertion.

The causes of the subacute form are different. Here we have the irritating discharges from the vagina playing the most important part. The discharge is often only slight, merely sufficient to spot or stain the

linen, and is often of a yellowish or greenish color, and of a strictly mucoid consistency. The mucous membrane may be somewhat swollen and puffy, and, in long-continued cases, may become ulcerated. Diabetes is also very commonly accompanied by vulvitis—so much so that its continued presence should always lead to the examination of the urine for sugar. It should be remembered that diabetes may exist without polyuria, and is often met with about the time of the menopause. The vulvitis of diabetes often presents a peculiar coppery-red color (Winckel). Ammoniacal urine, when combined with incontinence or a vesico-vaginal fistula, will also greatly irritate the mucous membrane which is constantly bathed with it. Want of cleanliness, especially in very hot weather and in very fleshy persons, may produce the disease. Masturbation and excessive venery more often cause this form than the other. When not due to the state of the urine, this disease is commonly found in unmarried, and especially young, women (Tait).

The symptoms are more or less burning and itching of the parts, generally intermittent, worse one part of the day than another, and the presence of a discharge. The constant scratching may lead to the establishment of the habit of masturbation.

Treatment.—The treatment of the acute form must consist, first, of rest in bed until the acute symptoms have passed. General treatment should be such as would tend to reduce arterial tension and allay excitement. For this purpose aconite and saline laxatives are indicated, especially if there be any fever. Locally, soothing and emollient applications, together with strict attention to cleanliness. The lead-and-opium wash is very generally recommended and used. Frequent ablutions from a fountain syringe of hot boric-acid solution, followed by dusting the parts with oxide of zinc or iodoform, will be of great service. All ointments made of lard or animal fats, unless containing an antiseptic, should be withheld; as, by decomposition of the fat, they tend to increase the irritation. Vaseline thickened with wax, or lanolin, is a suitable base for ointments. After the acute stage is over, astringent lotions, such as mild solutions of alum, or subacetate of lead, or nitrate of silver, may be used.

In the subacute form great care should be taken to remove all irritating discharges. If the urine is ammoniacal, it should be rendered acid by the use of benzoic acid (benzoate of ammon., gr. x, every four hours). Hot douches to the vagina, and cotton balls introduced within the vagina, to collect and keep back discharges, are also of great benefit. For local applications nothing acts so quickly and beneficially, as a solution of silver nitrate, ten grains to the ounce, brushed over the parts every day or every other day. If this fails, a stronger solution can be employed, or some other simple astringent used. It must be

borne in mind, however, that no permanent cure can be effected until the irritating discharge is stopped at its point of origin.

Diphtheritic Vulvitis.—A careful search has brought to light no recorded cases of simple primary diphtheria of the vulva in a non-pregnant adult. If it ever occurs, it must be very rare. On the vulva and vagina of children it is sometimes met with during epidemics. Occurring in the course of an attack having its primary seat elsewhere, or in the course of one of the exanthemata, it cannot be classed as a distinct disease, but is rather an epiphenomenon. In puerperal women during certain epidemics of puerperal fever, especially in large lying-in hospitals, it makes up a considerable part of the local lesions, and is a very dangerous complication. (The reader is referred to Dr. Lusk's excellent paper on puerperal fever in *Pepper's System of Medicine*.)

Gonorrhœal Vulvitis.—As this is but a single factor in the history of a disease involving other parts as well, it will be considered under the general title of Gonorrhœa. (See Diseases of the Vagina, Vol. II.)

Follicular Vulvitis.—This form of inflammation affects the sebaceous, sweat- and hair-follicles, which are so freely scattered over the labia majora and minora. The mucous follicles of the vestibule, as well as the glands of Bartholin, are not usually affected. The disease is fortunately rare. In general diffuse inflammation of the parts the structures named are affected, but in the disease now under consideration they are the sole or principal part diseased.

Causes.—The causes are usually some irritating secretion from the vagina, want of cleanliness, leaving the secretions between the folds of the parts until they undergo decomposition and become irritating. Pregnancy is often a predisposing cause.

Symptoms.—The symptoms are heat and burning, and above all itching, of the parts. The irritating character of the discharge from the inflamed glands, as well as any previously existing discharge, makes an irritated and sensitive condition of the surrounding surfaces. This is increased by the constant scratching to relieve the itching. Secondary results are painful micturition and dyspareunia.

Pathological Anatomy.—The affected glands become much enlarged and noticeable, and the surface around them red and swollen. The mouths of the glands are often stopped, the secretions are retained, and suppuration takes place. The glands which are not stopped pour forth a quantity of thick paste-like secretion, which in bad cases collects and forms a thick layer in the folds and creases of the membranes, completely covering up the glands.

Prognosis.—When occurring during gestation, the disease may be a serious complication, sometimes resulting in abortion. Fortunately, in these cases it usually ends with the pregnancy. In other cases it

may run a long course, gradually yielding to treatment; or may, if neglected, or even in spite of all that can be done, run on in the chronic form. It may then become a really formidable affection, rendering the patient nearly or quite insane from the constant irritation, itching, and burning of the parts.

Treatment.—In the acute form, cleanliness is the first requisite. If there is much vaginal discharge, this must be first relieved, or at least kept from the parts, by pledgets of dry absorbent cotton pushed into the mouth of the vagina and frequently changed, together with frequent vaginal injections, to wash away the discharge, as well as to cure the vaginal disease on which the discharge depends. As local applications, hot sitz-baths (75° to 80° F.) and the frequent washing of the parts with very hot solutions of borax, alum, or carbolic acid (1 : 40 or stronger) may accomplish a good deal. In the more chronic forms, solutions of nitrate of silver, 10–15 grains to the ounce, will be of great use. Persulphate of iron in weak solution has been recommended. Ointments, with vaseline, or vaseline and wax (ʒj to ℥j) as a base, may be used, medicated with subacetate of lead, bismuth, oxide of zinc, salicylic acid, or iodoform, and should be kept constantly smeared over the parts. In very bad chronic cases, strong solutions of silver nitrate (ʒj to ℥j) may be used, after a thorough cleansing of the parts with soap and water. In extreme cases the removal of the entire mucous membrane affected, has been resorted to. Great attention should be paid to the general health and nutrition. Tonics, cod-liver oil, and similar preparations should be used. The use of narcotics to quiet pain and produce sleep is attended with great danger, from the tendency to rely upon them, and thus form a habit. Opium, in particular, and chloral should be withheld until the case is found to be hopeless. This applies as well to pruritus, eczema, and other diseases attended with itching and consequent sleeplessness.

Phlegmonous Inflammation of the Vulva.—This consists in an inflammation affecting the connective tissue of one or both labia. It may follow a simple catarrhal inflammation, or be caused by mechanical violence. Prostitutes are peculiarly liable to this disease, and all the cases with which I have met have been among this class. After lasting a week or ten days the inflammation may subside, or it may result earlier in suppuration. In this way deep abscesses may form, and considerable sloughs come away. In other cases the disease seems more closely allied to the furuncular process. Hildebrandt states, that many deep abscesses opening on the vulva, have their origin in the deeper parts of the pelvis, from parametritis, bone disease, and ulcerative processes in the urethra and vagina. With this statement we are unable to agree, never having seen any cases to bear out this view.

The treatment of simple inflammation consists in hot fomentations,

lead-and-opium wash, and hot sitz-baths. Sulphide of calcium, in small doses frequently repeated, has the reputation of warding off suppuration in kindred affections, and will be worthy of trial here. If matter forms, it should be let out by free incision as soon as possible. The hypodermic injection of cocaine has served an excellent purpose in my hands in deadening the pain of this little operation.

Furunculosis (Boils).

Boils on and around the vulva are not very uncommon. They often depend on some constitutional condition, the exact nature of which is not well understood. They sometimes originate in an inflammation of the sebaceous or hair-follicles, and then closely resemble acne in the start. They are distinguished from that affection by their size and number. The irritation caused by the pulling out of a single hair may be the starting-point. Poisonous secretions or discharges may also be the exciting cause. When resulting from a general cause, they are apt to be persistent; occurring in successive crops, and lasting a long time. Some will suppurate and discharge; while others simply swell up, and afterward gradually fade away, leaving a red indurated spot.

Their favorite seat is the outside of the labia; but occasionally they extend up on to the thigh, or over the mons Veneris, completely dotting this with boils in various stages of growth and decadence. When occurring singly, they sometimes infiltrate the surrounding tissues, making a large abscess, which lasts for considerable time unless opened artificially.

Treatment.—This should be both general and local. The general treatment should be of a restorative nature—tonics, cod-liver oil, and especially the hypophosphites, which seem to have a controlling action on the dyscrasia. The sulphides also are of benefit. As to local treatment, the removal of all possible sources of irritation should be the first thing. When the boil has really declared itself, early incision, even before the formation of pus, will abort it. This can be done almost painlessly by the use of cocaine hypodermically. A rather free incision should be made, and then followed by an antiseptic lotion on a compress. In some cases it has been recommended to touch the cut surfaces with carbolic acid and glycerin, equal parts, or nitrate of silver. The object of this doubtless is to prevent absorption by the raw surfaces. After pus has formed incision and poultices are indicated.

Ulceration and Fissure of the Vulva.

Specific Ulceration.—Hard and soft chancres are very common among prostitutes. A consideration of these diseases is outside of the scope of this work.

Non-specific Ulceration of the vulva, except in childbed, is a rare affection. It is occasionally met with, especially among prostitutes, forming small sensitive sores around the entrance of the vagina or on the hymen. In poorly-nourished women a slight rupture of the perineum will sometimes result in a small granulating surface or ulcer, very tender and with slight tendency to heal. These peculiar ulcers are kept up by the tension of cicatricial bands drawing on the parts with the movements of the patient, and may be so sensitive as to cause great suffering and entirely prohibit intercourse. I have also seen ulceration around the clitoris seemingly dependent on a depressed state of the general system.

Treatment.—As it is easy to give the parts perfect physiological rest, the treatment of fissure of the introitus vaginæ is comparatively easy. By securing perfect rest, and by the application of iodoform, or moderately strong solutions (10 to 30 grs. to ℥j) of nitrate of silver, bismuth, or oxide of zinc, the disease is generally quickly cured. In the case of ulcers depending on cicatrices from a ruptured perineum, it may be necessary to cut the bands which pull on the edges of the sore, and thus give the parts rest. Usually complete healing then rapidly ensues. Severe ulceration sometimes occurs in the course of the continued fevers and in wasting disease.

Œdema of the Vulva.

Owing to the amount of loose connective tissue in and around the vulva, these parts are frequently the seat of œdema. This may be inflammatory in its origin, as in phlegmonous inflammation, or it may be only a symptom. In the latter case, its cause must be looked for either in some general condition, a disease of some distant organ, or in a disease in the pelvis impeding the return circulation. Among the general conditions causing œdema the commonest by all means is pregnancy. The distant organs, disease of which gives rise to œdema in this region, are the same as those causing œdema in other parts of the body which are usually coincidently affected—viz. the kidneys, heart, and liver, particularly the former. In the last stages of wasting disease it is not uncommonly met with, and is seen also in cancer of the uterus and in chronic pelvic inflammations. Fibroid and ovarian tumors, as well as diseases of the vagina, are sometimes, though rarely, accompanied by œdema of the vulva, the lower extremities usually being affected at the same time. The swelling may become so great as to materially interfere with the comfort of the patient. In extreme cases the circulation is so far affected that gangrene and septic processes may follow.

Treatment must, in the main, be directed to the general condition

causing the œdema. If extreme and causing suffering with danger of sloughing, multiple punctures may become necessary to relieve the tension. This procedure is not, however, without danger; as the parts are prone to take on inflammatory action, the punctures being the starting-points. If punctures are made, antiseptic washes must be freely used. Carefully-graduated compression with a pad or an elastic T bandage may be of service, combined with the recumbent posture.

Gangrene of the Vulva.

In the adult, gangrene is usually found as a result of labor with previous œdema, or of some mechanical violence. It may also result in non-pregnant women as a consequence of œdema, thrombosis, or hæmatoma. Several cases have been reported where, from the use of a tampon wet in perchloride-of-iron solution, extreme sloughing of the vulva and vagina has followed. It also occurs in the course of the exanthemata, preceded usually by an inflammatory process.

In young children there is a form of gangrene which is held by some[1] to be identical with noma and hospital gangrene. The disease, according to this author, is contagious and inoculable. It begins as a whitish blister, which soon changes into an ulcer and grows rapidly, the surface being covered with a soft gray or brownish membrane. It resembles diphtheria in some respects, but can be distinguished from it. The disease is local in its origin. The affected portion becomes gangrenous, and loss of substance takes place. The prognosis is bad, general putrid infection usually taking place.

Treatment.—In the ordinary forms the principal point is to guard against septicæmia. To this end all sloughing masses must be cut away, care being taken not to cut living tissue more than is necessary. Where fresh tissues are cut, the mouths of the vessels must be sealed by the actual cautery, and free use of antiseptics resorted to. In noma, iodoform is claimed to act as a specific; chlorate of potassium is also highly recommended. Internally, tonics and stimulants must be freely used, and the strength maintained by abundant nourishment.

Varicose Veins of the Vulva (Phlebectasia).

The veins of the vulva may be permanently dilated, sometimes forming immense tumors or swellings. This affection is found at all ages, though rarely among the young. It is usually related more or less closely to pregnancy, but cases have been observed in women who had never been pregnant. I have met with one such case. If antedating pregnancy, it is always aggravated at that time.

[1] Damien Surjus, *Thèse de Lyon*, 1882.

Cause.—A congenital or acquired thinning of the walls of the veins must be supposed; in addition to this an increase in the venous pressure, due to obstruction of the return circulation. These conditions are most perfectly fulfilled in pregnancy, and we find the disease more common at that time. In the non-pregnant the same condition may be produced by tumors, also by obstinate constipation with straining at stool (Winckel). Lifting heavy weights, the constant maintenance of the erect posture, may also have an influence in causing the difficulty.

Symptoms.—The symptoms are the presence of more or less swelling of the external genitals. It is sometimes confined to the labia, or may affect the nymphæ, the mons, and inside of the thighs as well. One or both sides may be affected. Holden[1] saw a case as large as a child's head. The swelling is usually quite irregular in outline, and the tumor is soft and easily compressible, being much more prominent when the patient is standing. There is often a great deal of heat and burning in the parts, and sometimes obstinate pruritus. Rupture may take place and the resulting hemorrhage be quickly fatal. The dangers of rupture are increased during labor. If the rupture is confined to the walls of the veins, and the skin remains intact, a hæmatoma will result.

Treatment.—Remedies directed to the condition of the veins will accomplish little. Ergot, hamamelis, and other drugs, used both externally and internally, have entirely failed in my hands. The wearing of a properly-constructed pad or supporter may diminish the tendency to growth, and in one case under my care certainly gave great relief. All attempts to tie the veins or to inject astringents into them would be certainly useless. If pregnancy should occur in a bad case, abortion in the early months would seem to be fully justified. The patient must be warned of the danger of rupture and hemorrhage, and told of the proper way of treating herself until she can obtain aid—viz. by assuming the recumbent posture and making direct digital pressure upon the bleeding point, or by a pad and T bandage firmly applied. This treatment may be supplemented by the use of astringents, by compression with a pad outside against a firm tampon inside the vagina and vulva; or the parts may be compressed against the pubic bone. If a large tear or rupture take place, such as might occur in labor, bringing the parts together by deep sutures may be necessary. At all times constipation, and consequent straining, must be avoided.

Hæmatoma, or Thrombus of the Vulva.

This may be defined to be an effusion of blood into the tissues of the vulva from the rupture of a vessel beneath the surface. The vessel

[1] *N. Y. Med. Record*, July, 1868.

ruptured is usually a vein, as it is not at all likely that an artery of any size could be ruptured in the soft tissues in which they are imbedded.

The *causes* are external violence, such as a kick, blow, fall, or instrumental delivery; and violent muscular effort, as in labor, or straining at stool. The predisposing causes are pregnancy and varicose veins, but neither of these is necessary for the occurrence of rupture.

Symptoms.—When rupture takes place the tumor develops rapidly. It may be quite small, or so large as to block up the vagina and urethra; and, if it occur during labor, it may be a barrier to the passage of the child. The seat is usually in the labia majora or in the parts near the clitoris. Winckel mentions having seen the blood escape into the remains of the hymen, forming a tumor as large as a bean or larger. If the tumor is small, very little inconvenience will be produced, but absorption will generally quickly take place. In the case of a large tumor absorption may take place; but there is more likelihood of suppuration and gangrene of the parts. The tumor then swells, becomes hot, tender, and painful; the skin assumes a bluish and purplish hue; and more or less constitutional disturbance ensues. Should the accident happen near the end of pregnancy, the ensuing labor is apt to cause either a renewal of the hemorrhage, or gangrene and sloughing of the parts. It might be well, should a large swelling exist when labor begins, to open it and turn out the clots.

Treatment.—For the lesser cases, little need be done except to protect the swollen part from irritation. Should inflammation threaten, the persistent application of cold by the ice-bag or rubber coil should then be tried; should the symptoms not soon show an improvement, free incision is indicated. It must not be forgotten that quite threatening symptoms may be abated by treatment; and, on the other hand, after suppuration has once begun, the earlier the incision the better. When incision is made all the clots should be turned out, ragged edges trimmed off, and any sloughing tissues removed. Thorough irrigation of the wound with an antiseptic solution should then be made, the surfaces sprinkled with iodoform, and the cavity packed with gauze or cotton. This may be repeated until the wound is healed. Should hemorrhage occur after opening, it can be stopped by pressure, or the application of alum or other astringent. (For further details of this subject the reader is referred to works on obstetrics, to which it more properly belongs.)

Diseases of the Vulvo-Vaginal Gland.

It is surprising how little has been written in American literature concerning the affections of these glands; and yet Hildebrandt declares them to be among the most common affections of the external genitals

—an opinion in which, as applicable to a certain class of society, I can agree.

Catarrh of the Glands.—Hypersecretion from the gland is rarely observed. Winckel states, that he has seen the disease last for months. The duct is then dilated so that a sound can be passed, and a viscid mucus may be forced out by pressure. If the secretion is too thick to flow out, the mouth of the gland may become closed and a retention-cyst formed. Erich[1] has reported some cases of "paroxysms in the female resembling nocturnal emissions in the male." That this does occur I can also testify, having met with a case.

The treatment of catarrh of the glands is very unsatisfactory. I have succeeded in dilating the duct in one instance and injecting strong solutions of carbolic acid with benefit. In case nocturnal pollutions become excessive, so as to weaken the individual, after the failure of treatment calculated to restore the general health, Winckel has proposed the extirpation of the gland.

Inflammation of the Duct.—The excretory duct is about 2 cm. long, and opens just in front of the hymen or its remains. A fine probe can generally be made to enter it. This duct may become obstructed by inspissation of the secretion (catarrh), but this generally occurs as the result of an acute inflammation of the mucous membrane in and around the mouth of the duct. It may be obstructed also by venereal warts, either in the duct or outside near its mouth. This inflammation may be traumatic, but by all means the most common cause is gonorrhœal infection. As the result of the retention of the secretion, or of the products of the inflammation, a tumor or cyst is formed, which gradually grows until sometimes it is as large as a hen's egg. This crowds toward the middle line and obstructs the entrance of the vagina. According to Hildebrandt,[2] as the distension goes on a point is finally reached where, through the distension of the external tissues, the duct is easily opened; so that the secretions, generally pus, make their way out, and the tumor collapses. As the conditions which originally caused the excessive secretion and occlusion still exist, the sac soon fills again, with a like result. Sometimes an acute inflammation of the superimposed and adjacent tissues is set up, attended with much pain and annoyance to the patient.

Usually, the course of the disease is run in about a week.

Diagnosis.—The size and position of the swelling, just outside of the vaginal entrance, its superficial seat, and perhaps the history of previous swelling and collapse, with a discharge of mucus or pus, will serve to distinguish it from inflammation and abscess of the gland proper.

Treatment.—The treatment should be begun with an effort to re-

[1] *Maryland Med. Journ.*, 1882, vol. ix. p. 348.

[2] *Billroth's Handbuch d. Frauenkrankheiten.*

establish the natural opening of the duct. This may be done by carefully probing the canal, and, once an opening is found, by dilating it with graduated sounds. In searching for the opening to the duct it must not be forgotten that there are two or more mucous follicles opening in its immediate neighborhood, which may be mistaken for it. If warts exist, they must be removed, and the associated gonorrhœal vaginitis cured. If it be found impossible to discover the duct, the swelling may be opened and the contents evacuated. If it again fills, a piece may be cut from the walls of the cyst with scissors, first lifting the wall with a tenaculum, so as to make a permanent opening. The cyst should be thoroughly irrigated, and a solution of silver nitrate (ʒj–ʒj) be injected; or the cavity painted out with strong tincture of iodine. I have found carbolic-acid solutions (1 : 20) serviceable in mild cases.

Inflammation of the Gland Proper depends in the vast majority of cases on an extension of a gonorrhœal inflammation from the vulva through the duct. In proof of this the gonococcus has been found in the secretions from diseased glands. Inflammation may also follow the introduction of other irritating vaginal discharges, such as those from cancer, and also from traumatism. As a result of the inflammatory swelling of the mucous membrane the duct always becomes closed. The inflammation almost invariably ends in suppuration and the formation of an abscess. It is a more serious affection than the one already described, in that it involves more tissue, makes a much larger tumor, and produces more constitutional disturbance, with fever.

Undoubtedly, many of the cases of so-called abscess of the gland of Bartholin involve only the duct. If the abscess goes on uninterfered with, it ends with rupture, sometimes through several openings. These leave fistulæ, communicating with a common cavity and opening on the surface of the labium majus. Before rupture takes place the tumor is situated deeply in the lower part of the labium majus. It can be felt, if small, by placing the index finger within the introitus vaginæ and the thumb outside of the labium. The tumor may reach a very great size, with extensive inflammation of surrounding parts, before rupture takes place. The inguinal glands of the affected side are sometimes enlarged and tender.

Diagnosis.—The position of the tumor will serve to distinguish it from most other diseases. The affections with which it might be confounded are pudendal hernia, hydrocele, and other kinds of abscess. From the first two, the history, together with the character of the tumor, and the presence of inflammation and its symptoms, should distinguish it. The different abscesses which are met with are either traumatic in their origin, or result from the suppuration of a pre-exist-

ing cyst or hæmatoma. In all these instances the history will aid in the diagnosis. Abscesses around the rectum may also closely simulate abscess of this gland. These abscesses always result from rectal disease, such as ulceration, fissure, stricture, or hemorrhoids. The history of such pre-existing trouble, together with the result of a rectal examination, will generally throw light on the case. I have seen several such abscesses resulting from stricture of the rectum, and in each case there was a labio-rectal fistula.

Treatment.—This will depend on the stage of the disease. If seen early and of a traumatic nature, leeches may be applied. If of a specific character, nothing can be done to abort the attack, and we have only to await suppuration, which can be hastened by poultices. As soon as the presence of pus can be made out, a free incision should be made on the inner side of the labium majus. The cavity must then be irrigated and washed out with the silver-nitrate solution, and packed with iodoform cotton. This may be repeated several times, until the cavity fills by granulation. If a recurrence takes place, a large piece of the wall of the abscess should be cut out, and the cavity painted out with some strong caustic, such as nitric acid. It is sometimes recommended to extirpate the gland, a matter of no great difficulty. An incision should be made over the gland, the whole enucleated, and the fresh surfaces brought together with deep sutures. Free incision and caustics will suffice in almost all cases.

Diseases of the Skin affecting the Vulva.

Under this head will be considered those diseases affecting the vulva which are commonly included among the diseases of the skin.

Alopecia.—The hair on the external genitals is generally lost after each labor; but the loss and the reproduction are so gradual, being simultaneous, that the fact is not generally noticed. In certain diseases in which there is a great lowering of the general system, the wasting affecting particularly the genitals, the growth of the hair is interfered with, and it may be entirely lost. This occurs sometimes in cancer of the uterus, especially in old women. Premature and senile baldness, which so commonly affects the scalp, is rarely seen affecting the pubic hair.

Alopecia areata, the nature of which is not well understood, though many consider it as parasitic, sometimes affects the whole body or certain circumscribed areas, one of which may include more or less of the external genitals. As the presence or absence of hair on the pubes is of little consequence, no treatment directed to this region is necessary.

Inversion of the Hair of the Labia (*Trichiasis*).—Meigs[1] has described two cases where strong stiff hairs, found on the edges of the labia, were turned in, as they sometimes are on the eyelids. This condition provoked considerable irritation and led to intense pruritus. Such conditions are rare, and would be apt to be overlooked. Removal of the offending hair and the destruction of the follicles by electrolysis would be the only and a most effectual treatment.

Herpes vulvaris (*H. pudendalis*).—This affection is not very common, and is chiefly met with in young women and among the unchaste. Greenough considers that gonorrhœa and the venereal diseases are predisposing causes. There is certainly an individual predisposition without assignable cause, which shows itself by repeated attacks. The parts usually affected are the labia majora, and occasionally the nymphæ and the skin around the vulva. It generally causes very little pain or sensation of any kind, but it may begin with burning and itching, and even rarely with severe neuralgic pain. There are in the beginning vesicles, singly or in groups, on a slightly reddened base. The contents of the vesicles soon become turbid, and crusts form, so that at the end of two days only scales or scabs can be found. There may be one or more groups of vesicles, usually not more than two or three, rarely ten or fifteen. The scales or crusts may come off and leave a slight ulcer. The course of the disease is usually about a week; but often one crop of vesicles is succeeded by another, so that the whole course of the affection may be extended over a number of weeks. If there is much itching, the consequent scratching may result in excoriations, or even large deep ulcers.

Diagnosis.—Great care must be taken not to confound this simple disease with true venereal ulcers. The diagnosis can usually be made by watching the case, and observing the formation of new lesions, and the rapid and complete disappearance of the old under simple treatment. For this reason all caustics, which might make indurations, are to be withheld, and simple ointments used, which will not obscure the course of the disease. If under this plan of treatment the ulceration grows larger and suppuration takes the place of the watery discharge, the specific nature of the ulcer will be manifest.

Treatment.—It is advised by some authorities to withhold water in any form as an application to the affected parts. Ointments of borax, or boric acid, or oxide of zinc, or lead may be used with benefit. Duhring recommends borated cotton as a dressing. A large pad can be worn and kept in place by a bandage. Dusting with tale, calomel, bismuth, or starch may prove efficacious. A gouty or lithæmic condition of the system sometimes accompanies herpes, and perhaps stands

[1] C. D. Meigs, *Am. Journ. of Med. Sci.*, 1862, xliii. 328.

in the relation of cause and effect. Medication directed to its relief is certainly indicated if it is found to exist.

Prurigo.—This affection, generally called lichen by British writers, is a papular disease, which sometimes attacks the genitals in connection with its appearance on other parts of the body. As it is characterized by great itching, its appearance is apt to be much altered by the frequent scratching; and a diagnosis can best be made by examining other parts of the body where the eruption remains unchanged, as advised by Mr. Tait.

The treatment recommended is dry powdering with bismuth and similar substances, or bathing with strong solutions of carbolic acid. Careful attention should be paid to the patient's general health. The disease is very difficult to cure and runs a long course.

Erythema.—The outside of the labia and the contiguous parts of the thigh, as well as the cleft between the nates, are often affected by this disease, especially in hot weather. It is brought on by exercise, want of cleanliness, and irritating discharges, and is sometimes so great an annoyance as to compel almost complete abstention from walking. A case under my care has resisted almost every treatment, and has experienced really severe suffering. It is commonly met with in fat people, but a peculiarly thin and sensitive skin seems to be a prerequisite. The affected parts become red, irritated, and even raw. They are very sensitive, and the movement of one surface on another causes considerable pain.

Treatment.—As, in these cases, there is generally a tendency to suboxidation, the condition of the urine should be carefully examined, and the lithæmic condition, if present, removed by alkalies, careful diet, and exercise. Locally, drying powders afford much relief. Bismuth and boric acid, one part to ten, and powdered talc, are among the best.

Eczema may be either acute or chronic.

Acute Eczema.—The manifestations of this disease on the vulva do not differ much from those on other parts of the body; it is a comparatively rare affection. Its causes are obscure, but it is sometimes dependent on uterine or ovarian disease, leucorrhœal discharges, and diabetes. The parts attacked may be the labia or mons, and the process may even extend into the vagina. The labia become swollen and red; vesicles appear, which soon break and leave a raw surface, from which a thick, gluey fluid is freely secreted. This discharge stiffens on the clothing when dry, and forms crusts over the affected part. Opposing surfaces are often glued together. The symptoms are burning and itching, sometimes of the most agonizing character. The

disease may begin as an acute affection; but, if not removed by treatment, it tends to become chronic.

Chronic Eczema.—This form of the disease may be subacute from the start, or may result from an acute attack. The parts usually affected are the crease between the labia majora and minora and the mons. We find a red, slightly raised surface; the color varying from light to dark red, and fading imperceptibly into the surrounding skin. The portion attacked may be quite small, or extend over a considerable surface. Sometimes the skin is covered with scales; and there may be deep excoriations and small crusts, due to scratches. The surface may exude small quantities of clear watery fluid. The symptoms of this form do not differ much from those of the acute disease. There is usually a burning and itching, worse at different parts of the day, and a feeling of stiffness in the parts. The disease is very rebellious to treatment, and when cured in one place often moves to another. Sometimes it responds quickly to treatment, and recurs again with equal promptitude.

Treatment.—For the acute form the black wash is highly recommended, together with oxide-of-zinc or calomel ointment. Carbolic-acid ointment (1 : 60) is also of value. The crusts, if formed, must be all removed by poultices and the parts kept perfectly clean. For this purpose water should not be used, but oil or vaseline on absorbent cotton or lint.

In the chronic form great relief to the itching may be derived from the application of very hot water on a sponge, followed by carbolic-acid ointment. I recently cured a most persistent case with borax and glycerin. The tarry preparations, such as oil of cade made into an ointment, will be found beneficial; and painting the parts with very strong solutions of silver nitrate or tincture of iodine once in four or five days does good.

Erysipelas.—When confined to the vulva this disease does not differ from the same affection found elsewhere on the body. It is not uncommon in children, especially infants, and is said to be common in women subject to discharges from the vagina of an irritating character (Hildebrandt), as in vesico-vaginal fistula. The treatment is to be carried out on the same general principles as when other parts are affected.

Pityriasis versicolor.—This disease is due to the growth of a vegetable parasite (*Microsporon furfur*). It is characterized by irregular spots or blotches, of a yellowish color, slightly raised above the surface. Sometimes the spots are of a brownish, dirty color. It may be distributed over large areas or confined to the mons and vulva, extending more or less on to the abdomen and thighs. It often causes

great anxiety, as do most diseases on the skin of the vulva, on account of a suspicion of its specific nature, and is not unfrequently mistaken for something of this kind. If there is any doubt, a microscopic examination of the scrapings from affected spots will set it at rest.

Treatment.—This consists simply in the application of a parasiticide. For this purpose corrosive sublimate will be found efficient in solution of 2 to 5 grains to the ounce. Solutions of hyposulphite of soda, carbolic acid, and tincture of iodine will also answer. Frequent washings with strong soap will render the action of the applications more certain. Great attention to cleanliness is necessary in all cases.

Scabies.—This affection seldom occurs on the genitals, but the possibility of such an event must not be forgotten, as an accurate diagnosis is essential to success in treatment. A careful examination of the hands will serve to make the diagnosis complete. The usual sulphur treatment is quite applicable. As it may complicate other forms of skin disease, or even cause them, the possibility of its occurrence should always be borne in mind.

Pediculus pubis.—The crab-louse is a not infrequent inhabitant of the mons and adjacent parts. In the earlier stages of its occupancy the only symptom is itching, so that the presence of this symptom, without other good reason, should always lead to an examination, when the presence of the intruder can be made out. The cause is almost always direct transference from body to body, usually at the time of sexual intercourse. Cases have been reported where the method of transference was inexplicable. The amount of local disturbance varies with the individual and the length of time the parasites have been present. When an eruption exists it usually resembles an eczema. The animal is to be found closely adherent to the roots of the hairs. The excrement and ova can also occasionally be seen.

Treatment.—The object is to destroy the parasite. This can be done with a mercurial ointment or with some liquid preparation. Tincture of delphinium has long and justly enjoyed a great reputation. A solution of carbolic acid (5 per cent.) and corrosive sublimate (1 : 1000) will also act efficiently. It has been recommended (Tait) to begin the treatment of most of the eruptions around the vulva with carbolic-acid lotion, in order to remove the possibility of this complication—a suggestion which can be well carried out, especially in the lower walks of life and in dispensary practice.

Pruritus vulvæ.—A large number of the eruptive and inflammatory diseases of the vulva are attended with more or less marked itching and burning. In the disease under consideration this symp-

tom exists, but without apparent anatomical lesion, at the seat of the itching, as its cause.

Cause.—There are several varieties of the affection, dependent on the cause. Unquestionably, one of the most common forms is that due to an irritating discharge. The discharge may be either urine, or abnormal vaginal, uterine, or urethral secretions. So commonly is this symptom found in diabetes that an otherwise unexplained pruritus should always lead to an examination of the urine for sugar. The vaginal discharge may be profuse and noticeable, attracting the patient's attention at once, or it may be so small in amount as to have entirely escaped notice. The discharge may have its origin either in vaginitis, endometritis, cancer, or other growth. Before the menopause attacks of leucorrhœa of uterine origin, attended by pruritus, are not uncommon, and are generally transient, being easily relieved by treatment or soon passing off if left alone. After the menopause these transient attacks are more seldom met with, and the condition, once established, is apt to remain indefinitely as senile catarrh. These cases afford the most rebellious examples of pruritus. It must not be supposed that endometritis and vaginitis alone can be the source of the irritating discharge. It may come from the urethra as the result of a urethritis, from Skene's glands in the urethra, from the vulvo-vaginal glands, or even from the mucous follicles. These facts must not be overlooked in searching for the cause.

Another form of the trouble is that due to purely neurotic influences. These cases are met with most commonly during pregnancy, and the itching sometimes extends from the vulva over the abdominal walls, so as to involve nearly the whole body. It has been thought to explain these cases, by supposing that the irritation is spread by direct inoculation with secretions from the finger-nails of the patient. This, however, will not explain all the cases, nor is this supposition necessary, as dermatologists admit a pruritus of neurotic origin.

Still a third class is described, where the itching is attributed to the presence of parasites. These may be the ordinary pin-worms which so commonly affect the rectum. They have been asserted to act in two ways—either by reflex action or by direct contact through migration into the vagina. The latter mode may occasionally occur in very young children, but the writer has never seen anything of the kind in adults, and doubts its possibility. If the worms do get into the vagina, the only way they could act on the vulva would be by means of a discharge, induced by their presence in the vagina. Vegetable parasites have been asserted to grow in the secretions and to be the cause of the pruritus. The *Leptothrix vaginalis* and *Oïdium albicans* are the varieties described, the latter being considered the most important in its effects.

It must not be forgotten that many of the diseases of the vulva already described have as a prominent symptom well-marked pruritus.

Symptoms.—The primary symptom is an itching on the surface of the vulva. It may be confined to a limited area or extend over all the external organs. A common seat is between the labia minora and majora, also on the inner surfaces of the labia majora. The perineum may be affected, and the itching extend to the parts around the anus. The sensation is often described as an itching or burning, with an almost uncontrollable desire to scratch and tear the parts for the purpose of gaining relief. The trouble is not generally constant, though in some cases it is so. It is more commonly intermittent, the remissions varying from hours to days or weeks. In some cases it comes on at night after getting into bed. This is particularly true of the neurotic form. In other cases it is worse in the early morning or some particular part of the day. Again, it will only be felt when the menstrual period is approaching or just after its close. After the disease has lasted for some time the parts either become thickened and leathery from constant rubbing, or they become covered with furrows and ulcerations from the use of the finger-nails. These furrows, being raw or covered with crusts, greatly resemble an eruption. In fact, an eczema may be thus induced and complicate the original malady.

Treatment.—The first step, in the institution of a rational treatment, is to find the cause and nature of the disease. If it be parasitic in its origin, the parasites must be removed. For pin-worms nothing is better than quassia infusion. The treatment must be directed both to the vagina and the rectum, the original source of the worms. For the vegetable parasites solutions of carbolic acid or sulphate of zinc will suffice. If the symptom is due to any of the eruptions, or local inflammatory affections found on the vulva, treatment for these particular conditions must be employed. If none of these conditions exist, a careful search must be made for an irritating discharge. This may be so evident as to attract the patient's attention and be by her recognized as the cause; but, again, it may be so slight as to escape entirely her observation as well as that of a careless investigator. In order to determine the causative relation of a suspected vaginal or uterine discharge, we may first carefully clean out the vagina by an injection of hot water and borax, and then lightly pack the vagina with dry salicylated or borated absorbent cotton. This will hold back the discharge, and in proportion to the relief afforded by the packing will the causative influence of the discharge be known. Having once determined the influence of the discharge, proper means may be taken to relieve it by appropriate treatment, directed to the vagina, cervix, endometrium, etc. In my hands the plan of packing with dry cotton or simply placing a large wad of dry absorbent cotton within the mouth of the vagina—something which

the patient soon learns to do for herself—has often served to afford immediate relief, while treatment was being directed to the removal of the cause.

For the alleviation of the symptoms many things have been recommended. Very hot water, applied directly to the parts with a large sponge, often affords great relief. The water may be medicated with borax, boric acid, soda, tobacco (ʒss–0j), lead, carbolic acid (ʒj–ʒiv), zinc sulpho-carbolate (ʒij–ʒiv), tincture of opium, etc. The following are a few formulæ which have been found useful, and are taken mostly from Goodell:

℞. Acidi acetici, fʒj;
Glycerini, fʒiij.
M. et Sig. Apply locally.

℞. Acidi carbolici, gr. xij;
Morphinæ acetatis, gr. viij;
Acidi hydrocyan. dil. fʒij;
Glycerini, fʒj;
Aquam, ad fʒiv.
M. et Sig. Apply locally.

℞. Chloralis,
Camphoræ, āā ʒss.
Misce, et adde—
Unguenti, ʒj;
Acidi borici, ʒss.
M. et Sig. Apply with a brush.

℞. Potassii cyanidi, gr. j–iij;
Liq. calcis, fʒiv;
Adipis, ʒiv.
M. et Sig. Apply locally.

Many similar formulæ will be found scattered through the textbooks, but these have proved more or less useful in the writer's hands, and can therefore be recommended.

In the purely neurotic form, remedies directed to the general nervous system, as well as local sedatives, may be of benefit. Among those most likely to do good are the bromides and zinc.

In diabetes cleanliness is of the utmost importance, and every drop of urine should be washed away from the vulva as soon as it is passed. Thomas advises, in order to keep it from touching the parts, the regular use of the catheter. In pregnancy the condition of the cervix and vagina must be carefully investigated, and local treatment used if necessary, as has been found quite safe. In the gouty diathesis which will not uncommonly be found complicating these cases, especially where there

is an eczema, the utmost care must be taken with the diet. All sweets, pastry, and rich and undigestible food must be avoided, and the patient urged to take plenty of exercise out of doors. A resort to the alkaline mineral waters and hot sulphur baths will often do good. It is not to be forgotten that the gouty diathesis is particularly common in this country among women, and is especially apt to show itself about the time of the menopause. As a local application cocaine, either as an ointment with lanolin or vaseline, or sprayed on in watery solution, sometimes affords relief. The solution must be strong, and even then the effect soon passes off. Its use in my hands has been unsatisfactory.

Serpiginous Vascular Degeneration.

This is an affection described by Mr. Lawson Tait,[1] which consists of a progressive atrophy of the mucous membrane covering the inner surfaces of the nymphæ. It occurs only at or after the climacteric, and is a very distressing and intractable complaint. The symptoms are dyspareunia, or total suspension of marital intercourse, from the intense pain produced by the act; also a slight yellowish discharge and scalding on passing water. Inspection will show one or two spots of redness on the mucous surface of the nymphæ, varying in color from a pale brick-red to a bright purple. The spots are exquisitely sensitive to pressure. If watched for a long time, these spots will be seen to disappear from one place and to appear in another, or the disease extends serpiginously, disappearing from the old site as it progresses toward the new. The course is very slow, lasting for years, for it seldom stops until it has passed over the whole mucous surface of the nymphæ. During its progress the vestibule slowly contracts until the introitus vaginæ is so small as scarcely to admit a finger.

Microscopically, Mr. Tait has found that all the textures are removed, except a few fibres of connective tissue; the walls of the capillaries are left thin and dilated, while the nerve-filaments are almost unprotected, thus explaining the chief clinical features of pain, vascularity, and later contraction. Finally, the nerves and vessels disappear and the pain and redness subside, leaving only a cicatricial contraction.

The prognosis is good as to ultimate relief from suffering, but the chronic course of the disease, extending over years, and the resulting contraction, should be explained to the patient.

The treatment advised is to touch the parts with strong carbolic acid. This gives temporary relief. Applications of a plug of cotton soaked in a saturated solution of neutral acetate of lead in glycerin, placed between the nymphæ at bedtime, is also useful. A pledget of dry cotton inserted between the affected parts is also advised to give

[1] *Diseases of Women*, p. 43. 1877.

relief in walking. Any existing uterine or vaginal disease producing an irritating discharge should receive attention.

I have never met with any cases of this disease, and am unacquainted with any references to it in American medical literature. Mr. Tait thinks it is often overlooked, and that many cases of so-called vaginismus are due to its presence.

Hyperæsthesia of the Vulva.

This condition of the vulva was first described by Thomas,[1] and certainly deserves general recognition. In describing it I shall follow closely the excellent account given by Dr. Thomas.

It consists of an excessive sensibility of the nerves supplying the mucous membrane of some portion of the vulva. The area of tenderness may be confined to the vestibule, to one labium majus, or to the meatus urinarius. The whole surface of the vulva except the outside of the labia majora may be affected, as the writer has once seen. The disease is fortunately not very frequent, though in this country it is certainly much more common than the disease described by Mr. Tait (see previous page). It seems not to be a true neuralgia, but an abnormal sensitiveness in the sensory nerves supplying the parts. There is no inflammation, but perhaps a few spots of erythematous redness here and there.

Cause.—It occurs most commonly at or about the menopause, and is predisposed by hysterical and hypochondriacal states. As exciting causes chronic vulvitis and irritable urethral tumors may exist, but in other cases no cause whatever is to be found.

Symptoms.—The principal symptom is pain on sexual intercourse. Any friction, even a cold or unexpected current of air, produces discomfort, while pressure is absolutely intolerable. Walking becomes difficult and the general health suffers. The mind is disproportionately disturbed and depressed. "In some cases it seems to absorb all the thoughts, and to produce a state bordering upon monomania."

Diagnosis.—It must be distinguished from the serpiginous degeneration of Tait, which it closely resembles, except in pathology and ultimate result; also from vaginismus and irritable urethral tumor. Neuroma may also produce similar symptoms.

Treatment.—The treatment is in the main unsatisfactory. Thomas declares that he has not succeeded in relieving a single case. In one case, which I had the opportunity of seeing with Dr. Thomas, he dissected off nearly all the mucous membrane from the vulva, with only temporary relief. Sims has done the same operation without success. Thomas recommends change of scene and surroundings, separa-

[1] *Diseases of Women*, p. 145, 1880.

tion from the husband, with the use of all agents to restore the general health; all local pelvic disease is to be cured, and the affected parts to be frequently bathed with warm water and sedative substances applied in the form of ointments. Among such substances may be mentioned carbolic acid, cocaine, chloroform, iodoform, bismuth, and cyanide of potassium.

Spasm of the Muscles of the Pelvic Floor.

Any or all of the muscles going to make up the pelvic floor may become spasmodically contracted. These spasms are manifested most commonly during coitus, or during an attempt at it, but in some of the muscles—the sphincter ani, for example—the spasm occurs at other times. To a spasm affecting particularly the constrictor vaginæ muscles we give the name of "vaginismus;" when the deeper muscles, especially the levator ani, are affected, the name of vaginismus superior has been applied. As these affections seem to be different, though closely related, they will be described under different heads.

Vaginismus.—The name "vaginismus" was first given by Sims (1861) to a spasm of the constrictor vaginæ muscles, manifested particularly on an attempt at intercourse. Huguier (1834) was perhaps the first to describe spasmodic contraction of these muscles. Kiwisch called it spasmus vaginæ, while Simpson described (1859) the same thing under the name of vaginodynia. The exact definition given by Sims is, "an excessive hyperæsthesia of the hymen and vulvar outlet, associated with such involuntary spasmodic contraction of the sphincter vaginæ muscle as to prevent coition."

Cause.—About few diseases of women has there been more differences of opinion than about this. It is now quite evident that there are several classes of cases, differing in their nature and cause. In one class the cause is to be found in some pathological lesion in or about the vulvar outlet; in another class the seat of the irritation causing the reflex spasm of the muscle is found to be in distant organs, as in the uterus, ovaries, or rectum; while in a third class no lesion can be found, but we must look for the cause solely in the nervous system.

In the first class undoubtedly the lesion, found usually in the hymen, is most commonly induced by repeated and unsuccessful attempts at coitus. The cause of the failure may be the awkwardness of the husband, through which he presses the penis in the wrong direction; but it may be, and most commonly is, found in some partial obstacle on the part of the woman. This may be a rigid and resisting hymen, an unusually small vulvar orifice, or a relative disproportion between the male and female organs. Again, the difficulty may be found, as Schroe-

der has pointed out, in the fact that the vulva is placed too high on the pubes, so that the space between the under edge of the symphysis pubis and the fourchette is so narrow that there is hardly room for the male member. In this case the penis either presses into the fossa navicularis, or more commonly impinges on the parts around the meatus and presses them against the bone, and may even dilate the urethra so as to admit of entrance there. Whatever the hinderance, the frequent unsuccessful attempts at intercourse, long continued and forcible, gradually induce a sensitiveness and soreness of the parts, sometimes accompanied by excoriations, as the writer has several times seen—sometimes by simple hyperæsthetic spots, so that the woman suffers extremely at each attempt. Following a law which exists in other parts of the body, the muscles surrounding the affected tender parts take on a condition of reflex spasm, and the condition of vaginismus is fully established.

In the second class we put cases dependent on what might be called accidental and concomitant lesions. These are uterine disease, such as displacements, endometritis, and lacerated cervix; a prolapsed and tender ovary; vaginitis; disease of the rectum, as piles, fissure and pin-worms; other diseases of the vulva, as fissure, herpes, eczema, and vulvitis. These cases are distinguished from those of the first class by the fact that the disease does not come on at the beginning of married life, but later, after the sexual act has been many times successfully accomplished, and even after children have been born.

In still another class we must look for the cause more in the natural disposition of the individual. A timid, nervous young woman who bears pain badly—and in this respect women differ markedly—is greatly agitated and very apprehensive at the approach of her husband. An instinctive dread causes her to offer more or less resistance, which hinders the proper accomplishment of the sexual act. The husband's efforts, perhaps forcible and rough, are attended by more or less pain, and this magnifies her dread and in turn increases her resistance. The muscles of the thighs and abdomen—in fact, the whole muscular system—are thrown into a state of tension almost amounting to spasm. In the case of the muscles around the vulvar outlet this contraction is heightened by the actual contact of the penis, and a condition of spasm is finally induced, as bad as in any of the other cases. Thus we have a vaginismus in which there is no pathological lesion, and yet the slightest touch of the vaginal outlet is sufficient to call into being all the characteristic symptoms. The cause is evidently largely mental, a fear of an anticipated pain being all there is in the beginning. Unquestionably, hysteria may play a large part in the causation, and is always to be taken into account.

In the experience of most authors, as well as in that of the writer,

the most common cases, as well as the severest, are those of the first class, the lesion being, as Sims pointed out, a tender, hyperæsthetic condition of the hymen or parts immediately around it, accompanied by more or less congestion and often eroded and reddened spots.

Symptoms.—The principal symptoms are excessive pain and spasm of the muscles around the vulva, induced by attempts at sexual intercourse. So severe does the pain become that the patient gets to really dread the approach of her husband, and all attempts are finally given up. If a vaginal examination is made in bad cases, so great is the pain and nervous apprehension that the patient is thrown into a state of violent nervous commotion. Often there will be general muscular agitation, intermittent rigors, and a most deplorable state amounting to even terror and agony (Sims). If now the finger is pressed into the vagina, the muscles will generally be found to be in a state of violent contraction. This spasm may be shared by all the muscles of the pelvic floor, especially the sphincters. In some cases the spasm and pain are not so severe, amounting rather to a hinderance than an absolute prevention to connection. Other causes have been noted for the spasm. Thomas mentions a case where there was a tendency to spasm "upon sudden changes of position or washing the genitals." In another case the spasm was brought on by contact of the clothing or finger used to stop a pruritus vulvæ. Walking has also proved sufficient to bring on an attack. Barnes observed cases where attempts at connection were followed by convulsions and syncope.

Diagnosis.—The history of the case will be generally sufficient to determine the nature of the affection complained of. A careful distinction must be made between vaginismus and dyspareunia dependent on other causes and unassociated with spasm. If there is any doubt, a vaginal examination will generally bring on a spasm accompanied by severe pain. In some cases even the touch of a camel's-hair pencil will be enough to provoke the characteristic symptoms. On the other hand, the writer has seen cases where a vaginal examination, even with a speculum, was possible without bringing on a spasm, and yet the slightest attempt at intercourse caused the introitus vaginæ to shut up as if held by a clamp. In another case the patient could introduce herself the largest-sized Sims dilator, but coitus was impossible. Both these were nervous cases, and one of them had borne a child, impregnation having followed a single successful coitus.

Prognosis.—If a local cause can be found for the disease, the chances of a perfect cure are good; but when the disease seems to be dependent on a purely nervous condition, it is extremely difficult to cure. If left to itself without treatment, the disease will continue indefinitely. Jenks reports a case of thirty years' standing. It is often supposed that childbearing will certainly cure the disease; this,

however, is a mistake, especially in the nervous cases, as the writer has several times witnessed.

Treatment.—The treatment proposed by Sims, originated after much research and many trials, was based on his idea of the pathology, and is the best yet devised for the cases which I have described as belonging to the first class. His plan consists in first dissecting away with curved scissors the whole of the hymen. This leaves a raw surface which heals by granulation. In order to prevent this, as well as to immediately control hemorrhage, I have brought the cut edges of the mucous membrane together with a continuous suture of fine catgut, thus avoiding the production of a cicatrix. After the wound has healed, the next step is to enlarge the opening of the vagina, thus cutting the tense and tender cicatrix if there be one. Sims's plan is as follows: "Place the patient on her back, as for lithotomy; pass the index and middle fingers of the left hand into the vagina; separate them laterally, so as to dilate the vagina as widely as possible, putting the fourchette on the stretch; then with a common scalpel make a deep cut through the vaginal tissue on one side of the mesial line, bringing it from above downward and terminating at the raphé of the perineum. This cut forms one side of a Y. Then pass the knife again into the vagina, still dilating with the fingers as before, and cut in like manner on the opposite side from above downward, uniting the two incisions at or near the raphé, and prolonging them quite to the perineal integument. Each cut will be about two inches long—*i. e.* half an inch or more above the edge of the sphincter, half an inch over its fibres, and an inch from its lower edge to the perineal raphé."

The further treatment consists in the wearing of a glass dilator devised by Sims and known by his name. This must be introduced and worn daily for several weeks, or till the parts are entirely healed and all sensitiveness removed.

In the nervous cases, if there is no lesion discoverable, the forcible dilatation of the parts under ether—and for this purpose I have found Goodell's speculum a most excellent instrument—followed by the glass dilators, gradually increasing the size until the vagina is thoroughly dilated and all tendency to spasm relieved, I have found a satisfactory method of treatment. If the spasm depends on diseases of other organs, these diseases must be removed by appropriate treatment; and this may in itself be enough, or it may be necessary to order the dilators for a time. Successful cases are reported of the cure of this symptom following the removal of hemorrhoids, and also of thread-worms from the rectum, corrections of uterine displacements, inflammations, and other similar conditions. Still, the cardinal point is the overcoming of muscular spasm, and this can best be done by Sims's dilators, either with or without previous cutting.

The plan of allowing coitus while the patient is under chloroform, with the hope that pregnancy may follow, is not to be recommended. Cocaine has also been advised, but on ordering it to be painted on by the husband, himself a medical man, I was surprised at his reporting that the cocaine, while destroying the sensitiveness of the vulva, also destroyed his power of erection. Still, favorable cases have been reported. Hot douches, sitz-baths, and anodyne applications may be beneficial, while the dilators are also being used daily. If much irritation of the mucous membrane around the vulva exist, applications of solutions of nitrate of silver (10–60 gr. to ℥j) often do good. Tincture of iodine and ointments of iodoform or cocaine may be of use. Simpson's suggestion of cutting the pudic nerve is of doubtful expediency.

Vaginismus Superior.—A condition of spasm of the muscles during coitus, by which the penis is imprisoned within the vagina, was noticed as early as 1729 by Schuregius.[1] Others have noticed it, but to Hildebrandt[2] we are indebted for a full exposition of the subject. He maintains that the spasm, which is met with in the upper part of the vagina, is due to the contraction of the levator ani muscle. He gives as cause some irritable or sensitive point high up within the vagina, as an irritable abrasion of the cervix or a tender prolapsed ovary. In the last edition of the work Zweifel[3] takes issue with Hildebrandt, and maintains that the levator ani alone cannot be the seat of the spasm, as it does not encircle the vagina, and therefore could not retain a speculum or swollen glans penis, as Hildebrandt asserts. He locates the spasm in the external muscles. This view would seem to be upheld by a very remarkable case of *cohesionis in coitu* reported by Dr. E. Y. Davis,[4] in which the penis was so firmly imprisoned during coitus that it was necessary to chloroform the woman before it could be released. "In this case there must have been also spasm of the muscles at the orifice as well as higher up, for the penis seemed nipped low down; and this contraction, I think, kept the blood retained and the organ erect." Debraud,[5] on the other hand, quotes a case in which the contraction was about two inches from the vaginal entrance and a little below the neck of the uterus and the vaginal cul-de-sacs: there seemed to be two muscular bands at this point, one on each side, which, contracting, narrowed the canal; the contraction was voluntary. I have seen spasm of the levator ani excited by moving the tip of the finger, which had been introduced into the vagina, after the sphincter muscles

[1] *Med. News*, Nov. 29, 1884, p. 663.
[2] *Handbuch d. Frauenkrankh., Billroth*, 1st ed.
[3] *Billroth's Deutsche Chirurgie*, Lf. lxi.
[4] *Med. News*, Dec. 13, 1884, p. 673.
[5] "Des Rétrécissements du Conduit Vulvo-vaginal," *Med. News*, *loc. cit.*

had relaxed. The effect of this contraction was to press the finger closely against the lower edge of the pubes, and to hold it quite firmly. There was no ring of contraction encircling the vagina.

I have met with several cases in which spasm of some of the muscles of the pelvic floor, accompanied by great pain, came on suddenly without any apparent cause, most often during sleep. This spasm in one case seemed to affect the internal sphincter ani muscle, and unless relieved would last almost continuously for days. It was easily stopped by a suppository or rectal injection containing opium. It seemed in this case usually to follow diarrhœa and to be accompanied by constipation. Hildebrandt has met with similar cases.

The treatment of these rare forms of spasm has already been alluded to in the text. All irritable tender points must be relieved. Section of the affected muscles has been suggested, as well as neurotomy, but it is little likely to be of use. When the spasm is continuous, relief may be obtained by anodynes applied as near the affected muscle as possible. The bowels must be carefully regulated, and all sources of irritation removed, while the general health is carefully looked to.

Coccyodynia or Coccygodynia.

This is a rather frequent painful affection of the muscles, tendons, and nerves of the os coccyx, with or without disease of the bone itself. It was originally described by Nott, but was overlooked and nearly forgotten until 1861, when a knowledge of it was revived by Simpson and Scanzoni.

Cause.—Unquestionably, childbearing is the most frequent cause, but it may undoubtedly occur in women who have never borne children and in men and young children. Other causes are mechanical violence, as a kick, blow, or fall upon the coccyx, or horseback riding; uterine, ovarian, and rectal disease; cold and exposure, especially, as pointed out by Simpson, when conjoined with the rheumatic diathesis.

Pathology.—Displacement, fracture, and caries of the coccyx have frequently been noted. But something more than a dislocation of the bone is necessary, as every gynecologist must have frequently observed such dislocations without any accompanying pain. Hyrtl found thirty-two cases of luxation of the bone with ankylosis in one hundred and eighty pelves—a number far greater than the corresponding cases of coccygodynia. There must be, then, conjoined with the disease or displacement of the bone a hyperæsthetic or neuralgic state of the tendons or ligaments attached to the bone. This may be due to a chronic inflammation of the tendinous structure, or a direct involvement of the nerves themselves. As this condition of the structures involved may exist without any displacement or disease of the bone,

so we often find the bone, so far as we can discover, in every respect normal. On the other hand, the bone may be the real seat of the disease, caries existing, and the symptoms refusing to yield until the diseased bone is removed. A number of such cases have been reported. Rheumatism of the muscles or tendons has been observed, the disease being accompanied by other rheumatic manifestations, such as lumbago or muscular rheumatism in other parts. Uterine and ovarian disease may also be the starting-point.

Symptoms.—Pain in the region of the coccyx, aggravated by any motion which brings into action the muscles attached to the coccyx, is the principal symptom. The patient suffers on sitting down and on rising again, especially if she maintains the sitting position for long. Defecation is often agonizing, and coitus almost unendurable; sometimes even walking will increase the pain. The patient is often obliged to sit on the side edge of the chair, so as to avoid pressure on the bone, and to use the arms and hands as aids in getting up.

Diagnosis.—The conditions from which this must be distinguished are diseases of the rectum and anus, neuralgia of the sacral nerves, and hysteria. A physical examination will generally serve to make the diagnosis. With one finger in the vagina or rectum and the thumb outside, the bone can be seized and moved, when the characteristic pain will be produced. Pressure on the bone through the skin will also provoke pain. Negative evidence will be the absence of disease in the rectum and of pain on pressure over the inner surface of the sacrum. The hysterical counterpart of the disease may be distinguished by absence of fracture or caries, and by "noting the irregularity of the pain in the hysterical affection, an indescribable affectation of suffering, and the lack of consistency in the behavior of the symptoms" (Goodell).

Prognosis.—The disease shows little tendency to spontaneous recovery, but, fortunately, nearly all cases can be cured by proper measures.

Treatment.—The hysterical form must be treated by agents directed to the general condition of the nervous system, as well as to the removal of any uterine or ovarian disease. The rheumatic form must be treated by remedies directed toward that condition, together with careful attention to diet and exercise. Counter-irritation by the actual cautery or blisters will also do good in this form. In the milder forms of the disease the endermic use of morphia, the use of ointments of veratria and aconite, should be tried. Electricity has been successfully employed—a mild galvanic current with one pole (−) in the rectum and the other (+) on the outside. In rheumatic cases faradization is generally likely to do more good. Should all these measures fail, a more radical plan may be adopted. We have two operations—separation of the coccyx from all its tendinous or muscular attachments, and total extirpation of the bone. The first plan was proposed by Simpson, the last by Nott.

The separation of the ligaments is to be done subcutaneously. A tenotome is introduced under the skin near the end of the bone; it is then carried up over the bone with its flat side toward the outer surface, until the point is above the sacro-coccygeal articulation; it is then carried to one side of the bone, and turned so that its cutting edge is toward the rectum, and withdrawn, severing, as it passes, all the tissues attached to the side of the bone. It is then carried up on the other side and the operation repeated. The second side may be cut without taking the knife entirely out of the wound. If a hypodermic injection of cocaine into the affected part (10 ♏ of a 4 per cent. solution) be given just before operating, no pain at all will be experienced. The writer has performed this little operation several times with fairly good results. If it fail to give relief, the plan suggested by Dr. Thomas may be tried. He cuts down upon the bone, raises it with the finger, and severs all its attachments with scissors.

When the bone is carious, and in other cases where milder means have failed, Nott's operation is the only one which offers any prospects of relief. The bone is laid bare, its attachments severed, and the bone disarticulated. It will be found convenient, after cutting down to the bone, to disarticulate it first and enucleate it, as it were, beginning at the base and finishing with the point. A heavy pair of forceps is necessary to hold the bone and lift it up while the attachments are cut with scissors. The resulting wound must be left to heal by granulation, a drainage-tube being left in place for several days to ensure a free discharge from the cavity, and antiseptic injections used as long as there is any discharge. I have operated several times with complete relief to the symptoms, though they had lasted for years. Many other successful cases have been reported.

New Growths of the Vulva.

Lupus of the Vulva.—Dermatologists describe two forms of this disease, L. erythematosus and L. vulgaris. The first-named does not seem to occur on the vulva, the face and scalp being its favorite seat. This form is non-ulcerative.

Lupus vulgaris, Esthiomène.—Duhring describes lupus vulgaris to be "a cellular new growth characterized by variously sized and shaped reddish or brownish patches, consisting of papules, tubercles, or flat infiltrations, usually terminating in ulceration and cicatrices." If the tubercular nature of the affection be admitted, we must consider it rather as a specific inflammation than a new growth. With this exception it is well to keep the definition in mind, as it will help to exclude certain affections wrongly described as lupus.

Frequency.—Dermatologists declare primary lupus of the vulva to be exceedingly rare; many authors do not even mention it; but, as might be expected, the gynecologists meet with it more commonly. Duncan and Tait both declare that they have met with it quite often, the latter most often in private practice, the former in hospitals. In this country it must be rare, as it is scarcely mentioned in gynecological textbooks of American origin. The writer has met with it but once. The frequency asserted by Duncan and Tait must be ascribed to their considering as lupus certain conditions not so considered by other authorities.[1] Probably less than fifty cases have been reported all together.

Age.—The disease on other parts of the body seems to affect the very young, though rarely observed before the second year of life. Of cases occurring on the vulva in Taylor's table,[2] the youngest was thirteen and the oldest fifty-six. The period of greatest liability, according to West, is between twenty and thirty.

Etiology.—Attempts have been made to show that all the cases of ulceration around the vulva described as lupus are in reality due to syphilis. This attempt has failed, as Taylor[3] has well shown. As has already been mentioned, the tendency of late has been to class this disease rather with the inflammatory affections than with new growths. Recent experiments would seem to point to a specific germ, the bacillus tuberculosis, as its cause, thus grouping it with tubercular inflammation—a class of diseases now well recognized as much more common than was formerly supposed.

Koch, Cornil, Doutrelepont, and others have shown the presence in lupous tissues of all sorts of a bacillus identical with that found in, and supposed to be causative of, true tubercle. These bacilli are very scanty, but still, it is asserted, are always present. Inoculation with these same tissues has produced tuberculosis in the lower animals. Artificial cultivations of the bacillus obtained from lupus, extending over many months, have retained their identity and their power of inoculation. These facts in the pathology of the disease, if accepted, are of great importance in their bearing on therapeutics.

The existence of a peculiar diathesis, the scrofulous, has been asserted[4] to exist in proportions varying from 30 to 60 per cent. in cases of lupus. In certain cases, on the contrary, perfectly good health has been specially noted. Accepting the infection theory, we naturally look for the cause in the direct inoculation of the specific bacillus, together with a certain predisposition or diathesis which enables the bacillus to retain a foothold once obtained, and to grow and multiply. But even admitting this to be true, it only partially ex-

[1] See *Obstetrical Trans.*, 1885, pp. 243–250.
[2] *Gyn. Trans.*, 1881, p. 210.
[3] *Loc. cit.*
[4] J. C. White, *Boston M. and S. Journ.*, vol. cxiii p. 109.

plains the phenomenon; for this manifestation of the bacillary invasion is so different, anatomically and clinically, from that ordinarily seen in other forms of tuberculosis, that some modifying condition, not yet understood, must be supposed in order to account for it. While the bacillus of lupus will produce tuberculosis, lupus has not yet been produced by any form of artificial inoculation. The source of the bacilli is not far to seek. The spores are found to be present in all places where phthisis exists, so that only a superficial excoriation or abrasion is necessary to give a point of entrance. Once engrafted into the tissues, it grows and disseminates itself, but only very slowly and apparently with great difficulty. Should it gain access to the circulation, a general tuberculosis may follow. If we reject the theory of a specific bacillus, we know nothing of the causation of this disease.

Pathological Anatomy.—Virchow grouped lupus with the granulomata, and the lesion does seem to resemble granulation tissue. It affects mostly the cutis or mucosa, sometimes penetrating the deeper structures, but never, apparently, affecting bone. Lupus in other parts of the body occurs mostly in nodules or tubercles. Dr. Thin, however, asserts that in the vulva it is rather diffused through the tissues, like any chronic inflammation, the greater number of cells being in the neighborhood of the vessels. Here we find a thick infiltration of leucocytes, the infiltration tending to spread and coalesce with neighboring foci. The infiltrated tissue tends to form new tissue, which in turn may ulcerate. There may be also an excessive formation of epithelial or epidermic cells over the affected part, with exfoliation. Mixed with the small cell-infiltration there are also certain epithelioid and giant-cells. The tubercle bacilli may be found in the tissues after proper preparation, but sometimes an immense number of sections, forty-seven in one case (Cushing), may be necessary before they can be recognized. There is but little tendency to cheesy degeneration, in which respect this tissue differs greatly from tubercular tissue found elsewhere. There is always more or less hypertrophy of surrounding tissue, and in some cases the tubercles are heaped together like strawberries (Taylor), which masses may in turn coalesce with larger masses.

Clinical History.—Duncan makes two principal forms, L. minimus and L. maximus. The former, he says, occurs mostly within the vulva, and may on superficial examination be mistaken for urethral caruncle or eczema of the vestibule or pruritus pudendi. In another place, however, he expresses his doubt as to the identity of these slight cases with true lupus. Without a microscopic examination of the tissues or a more detailed description we must admit his doubts as the truth.

Clinically, we may make three principal divisions: 1, Lupus serpiginosus, ulcerans, or exulcerans; 2, lupus perforans; 3, lupus prominens.

Lupus serpiginosus.—In this form the superficial tissues seem to be the ones affected. The labia majora, or the crease between the labia and the thigh, are often the parts first attacked (Taylor). Sometimes the disease begins on the cervix or within the vagina, and works its way outward. Beginning as a small tubercle, or tubercles, of a reddish or brownish color, the disease gradually extends, the affected tissues breaking down into ulcers, which spread until the labia, mons, and, in fact, the whole vulvar and anal regions, are involved in one extensive patch of tubercular ulceration. In the central portion of the diseased parts cicatrices may form, in turn to be again attacked and destroyed, or the healing process may extend and be permanent. In some of the cases granulations spring up around the ulcers, giving the form known as lupus hypertrophicus.

Lupus perforans.—The disease sometimes shows a tendency to attack the deeper tissues rather than the superficial, undermining, and finally destroying, the overlying patches. In this way the rectum, vagina, and bladder may be attacked, and great destruction caused in the deep tissues, forming large caverns with perhaps only small external openings. These forms may coexist, as Huguier, to whom we owe the first (1848) description of the disease, points out. He described and pictured a case with deep perforating ulcer of the vulva, and superficial ulcerations around the anus, with great hypertrophy.

In *lupus prominens* the tubercles seem to be the distinctive feature. They grow and coalesce, forming large bright scarlet or reddish, and sometimes brownish-purple, masses as large as half of an egg cut in its long axis (Taylor). These masses may be several inches long, and six or eight of them may coexist (Fig. 178). This form seems to affect mostly the outside of the vulva.

In all the forms there is more or less hypertrophy of the labia minora and majora, and the clitoris, or even the whole vulva may be similarly affected. This is entirely independent of the growth of true lupous tissue in the parts, though of course the lupus must antedate the hypertrophy. The enlarged parts are then hard, pale, or dull white. The hypertrophy remaining after the disease is of a similar nature.

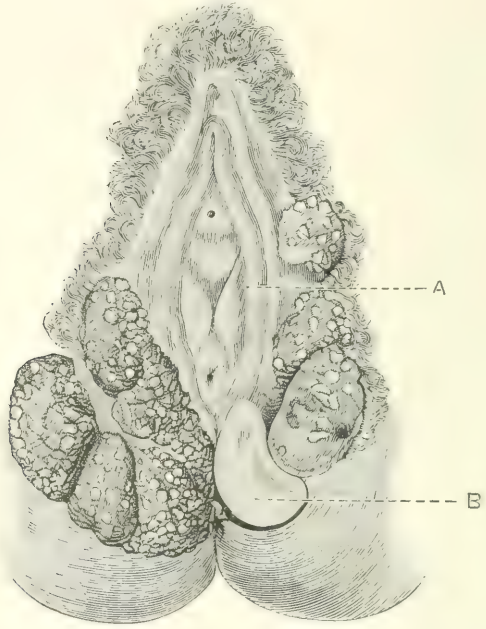
The discharge from the ulcers varies. In some cases there is "laudable" pus, in others a sero-pus, and in some only a watery discharge. Some of the cases seem to have a great tendency to hemorrhage. Matthews Duncan describes a form of the disease which he calls hemorrhagic lupus, and reports four cases.[1] The microscopic examination of these cases shows a different histological structure from ordinary lupus. This form is generally insensitive, but occasionally is tender and painful. He reports one case where the hemorrhages extended over fourteen years. The hemorrhages may be long and slight, or short and

[1] *Edin. Med. Journ.*, July, 1884.

very severe. Dr. Duncan considers this disease to be allied with senile vaginitis. From his descriptions it can hardly be a true lupus.

Symptoms.—The symptoms of ordinary lupus are almost none. In many cases the patient seems to be in perfect health; in the majority

FIG. 178.



Lupus Prominens: *A*, hypertrophied labia minora; *B*, after application of escharotics.

of cases there is little pain. If the rectum or other passages are affected, there may be stricture or fistulæ with attendant symptoms.

Prognosis.—Lupus is seldom a fatal disease. It runs a very long and chronic course, and in a small percentage of cases ends in spontaneous recovery. A still larger number are cured by appropriate treatment. Taylor collected the statistics of 21 cases: 6 were cured; 7 relieved, 4 not relieved, and 4 died. From this we see that nearly two-thirds were cured or relieved.

Diagnosis.—The diseases most likely to be confounded with lupus are cancer, syphilitic ulceration, ulcerative chancroid, and elephantiasis. From cancer it can be diagnosed by its extreme slowness of growth, often great hypertrophy of surrounding tissues, and prominent tubercles. The general health of the patient is good, and there is absence of general symptoms. The presence or absence of pain is not to be depended on as a distinguishing mark. From syphilitic disease the affection is distinguished with more difficulty, but the history of the case and the behavior under treatment will give aid. Extensive

syphilitic ulceration of the vulva is even more rare than true lupus. Phagedenic chancre is much more rapid in its growth, and the color of the base is more gray and yellowish-white than in lupus. When cleared of discharge the base is red. Chancroid has none of the thickening of surrounding tissue, and tubercle formation is wanting; the history will also serve to exclude it. In lupus the inguinal glands are seldom if ever enlarged. The examination of the discharges for bacillus tuberculosis with an affirmative result will be decisive, but a negative result will prove nothing. It is not to be forgotten that cancerous disease may develop on lupous tissue and obscure the diagnosis.

Treatment.—Internal medication will accomplish but little. There is no specific for this disease. The drugs which have been most used are arsenic, iodine, and mercury, the so-called alteratives, together with agents supposed to have an effect on the strumous diathesis—cod-liver oil and iron. Their use has proved unsatisfactory, and they cannot be depended on to the exclusion of local and surgical treatment, which offers almost the only hope of success.

Acting on the parasitic theory of the disease, recent authorities have recommended the antiseptic method of treatment; and if the methods of the older writers be examined, it will be found that the most successful have been those which are in harmony with this idea. If we concede that lupus is a form of tuberculosis, and that tuberculosis is due to the presence of a bacillus in the tissues, the only rational plan is to use such agents as will destroy the cause. Koch by his investigations has shown which are the agents most potent against the parasites; among them he names mercuric chloride first, and chlorine, iodine, and bromine waters in the order named.

Doutrelepont in 1884 tried the bichloride, and was quickly followed by others in trials of this agent, as well as of others of a similar nature, such as sulphurous, carbolic, and salicylic acids. Very successful results have been recorded by the dermatologists with lupus on other parts of the body, but so far the writer has seen no reports from the gynecologists. This is due, doubtless, to the rarity of the cases. Dr. J. C. White[1] reports twelve cases, mostly affecting the upper extremities. His plan of treatment was to use a sublimate solution (½–1 gr. to ℥j), applied for half an hour night and morning, followed by an ointment of the same (gr. j to ℥j). Near the mucous surfaces he found salivation easily induced, but on the skin no such trouble was encountered. His conclusions are very positive as to its curative effect: "If its use be continued long and thoroughly enough, a point not yet sufficiently determined, I see no reason to doubt its absolute power over the parasitic nature of lupus."

Mr. Hutchinson has strongly recommended sulphurous acid, and

[1] *Boston Med. and Surg. Journ.*, Oct. 29, 1885.

Marshall has advised salicylic acid. Lately, iodol has been used with success. A 10 per cent. ointment of pyrogallic acid is highly recommended. It attacks only the diseased tissues, which it turns black. It must be repeated several times.

Surgical interference has been generally recommended. This has included the excision of the diseased parts as far as possible, scraping with a sharp spoon, scarification, the application of the red-brown cautery, the more extensive destruction of tissue by the white-hot point, and boring the tissues with points of silver nitrate: all these methods have their uses. The soft tissues can be scraped away with the spoon, and the sublimate solution applied to the diseased surface, thus bringing it in contact with deeper portions of tissue and hastening the cure. Large hypertrophic masses, which would shut in diseased surfaces and prevent their proper treatment, may be excised. There is but slight danger of hemorrhage, as bleeding points can be picked up by hæmostatic forceps as the incision is extended. There is little hope of getting primary union after such incisions, and probably brushing over the cut surfaces of tissue with the cautery may be a wise precaution, as it is not to be forgotten that after any cutting operation on lupous tissue a general tubercular infiltration is possible. Lately, Pick of Prague has recommended[1] cauterization by electrolysis. The tissues being first painted with cocaine, the positive current is applied to the surface with a bare metallic electrode. In this way the tissues are destroyed almost painlessly.

Elephantiasis Arabum (Pachydermia).—The pathology and etiology of the affection usually described under this head seem to differ so much in the different descriptions of individual cases that it would appear as if two distinct diseases, closely resembling each other in many points, but still with marked differences both in cause and mode of growth, have been confounded. The first of them is the true elephantiasis arabum, and the other we may best define as fibroma diffusum.

The generally accepted definition of elephantiasis as given by Duhring is as follows: "It is a chronic hypertrophic disease of the skin and subcutaneous connective tissue, characterized by enlargement and deformity of the part affected, accompanied by lymphangitis, swelling, œdema, thickening, induration, and papillary growth." Following the statement of Schwimmer, most modern authorities, especially the German, hold that the erysipelatoid attacks, by which true elephantiasis arabum of the extremities is characterized, are absent in elephantiasis of the vulva. This statement, however, I cannot find to be confirmed by those who have observed the disease in tropical climates, and therefore must hold

[1] *Med. Press of Western New York*, March, 1887.

that the disease described by the Germans differs in this respect, as well as in others, from the true Oriental type.

Another point of difference is found in the cause. Elephantiasis arabum is now quite generally admitted to be the result of a parasite, which is to be found at certain times in the affected part, while no such cause can be discovered in the disease as described and seen in Northern Europe and this country. Certain anatomical differences also exist which will be described later on.

Habitat.—The disease is very rare in the Northern portions of the United States, but is a little more common in the Southern States, especially among the colored race. In certain countries it is endemic, especially in low-lying districts, sea-coasts, and islands. It is very frequent in the West Indies, some portions of South America, Africa, India, and other tropical climates.

Etiology.—The cause of the disease is an inflammation and obstruction of the lymphatics (Duhring); and this has been attributed[1] to the presence in the blood and lymphatics of the *Filariæ sanguinis hominis* and its ova. The disease is not contagious or hereditary.

Pathological Anatomy.—The principal lesion seems to consist in an immense proliferation of the connective tissue, with a great amount of serous infiltration. The skin or mucous membrane covering the affected part is also increased in thickness, the papillæ enlarged, and the epidermis thickened. There is also a certain amount of pigmentation. The skin may be smooth or rough from papillary enlargement or warts. Late in the disease the nervous substance is destroyed. The lymphatic glands are swollen, and the lymphatics greatly dilated and distended with fluid, their walls thickened and of a light-yellow color. In those cases where the lymphatics are not affected the veins will be found markedly dilated, with distinct hyperplasia of the adventitia.[2]

Symptoms.—The disease is stated generally to begin with erysipelatoid inflammation of the parts, with fever, pain, heat, and swelling. Such an attack is followed by a slight enlargement, and is succeeded by other attacks until enlargement becomes more marked and permanent. At the end of about a year these attacks cease and the growth from that time on is gradual. The parts of the vulva generally attacked are the labia majora, clitoris, and labia minora. The growth increases enormously, often reaching forty to fifty pounds in weight and hanging down to the knees or ankles. Reyer[3] has published a large number of cases collected in Egypt. The tumors, he states, are often enormous and last twenty years or more. He describes these tumors as having a small navel-like depression in the upper third,

[1] Fayrer, *Lancet*, Feb., 1879. [2] Schwimmer, *Handbook of Skin Dis.*, Ziemssen.
[3] Quoted in Ziemssen.

which reaches down to the entrance of the vagina. The surface may be smooth or rough, warty, fissured, and ulcerated. Eczematous eruptions are not uncommon on the affected part. Maceration of the epidermis takes place from the moisture of the parts, especially in the folds of the skin. An oozing of lymph also occurs from minute openings in the skin, as well as from the ulcerated surfaces. Except from the weight and discomfort, and the impossibility of gratifying the sexual desire, the tumors do not seem to affect the general health of the patients. The inguinal glands are always swollen and enlarged, and occasionally form small tumors in the groin which sometimes admit of the escape of lymph (Schwimmer).

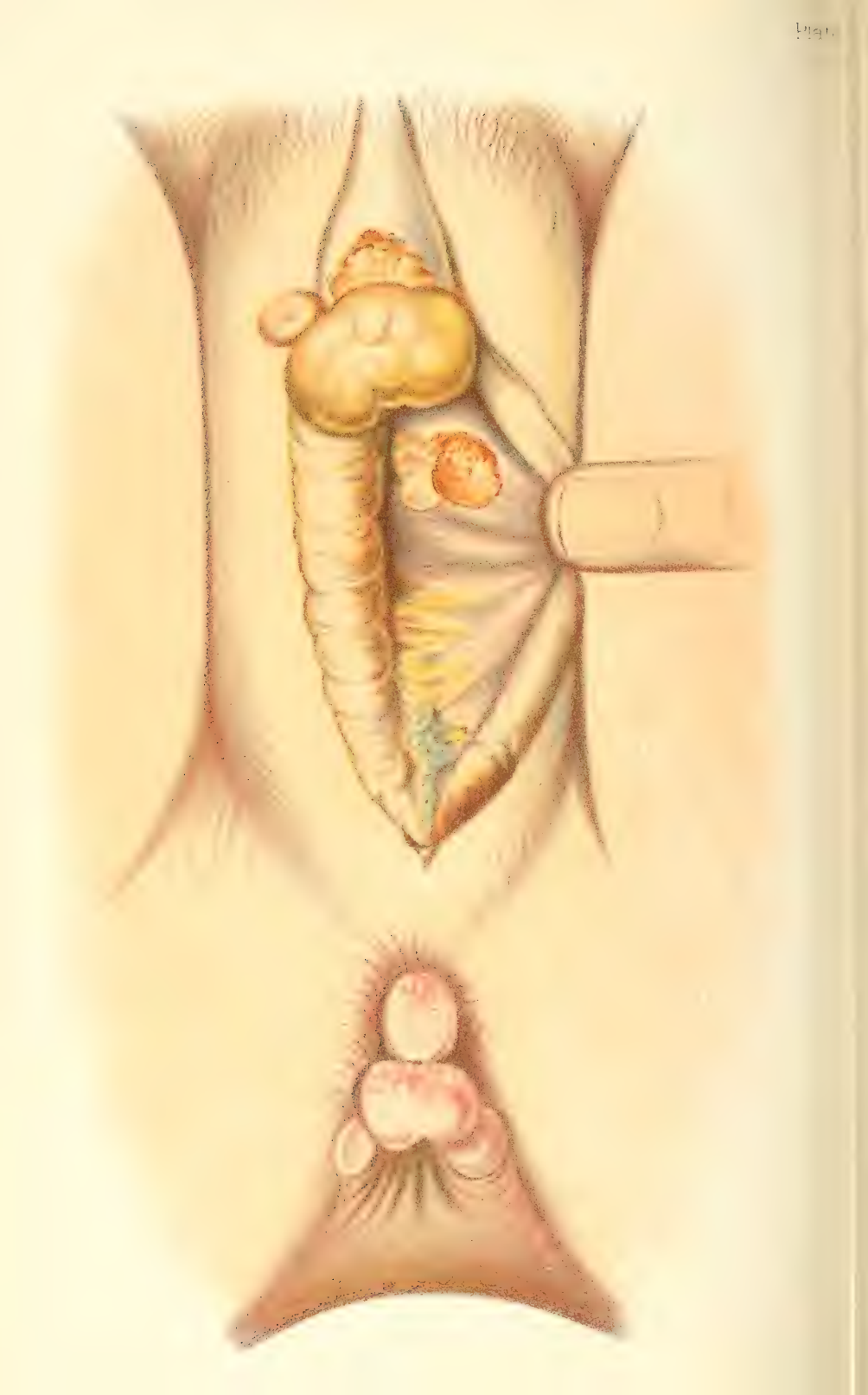
Prognosis.—The prognosis as to recovery, once the disease is well developed, is hopeless. It is stated that recovery occasionally occurs in young subjects early in the disease. The affection runs an indefinite course, and while it does not ordinarily prove fatal, the wretched condition of the victim is often worse than death. When fatal the result is brought about by thrombosis and pyæmia.

Diagnosis.—True elephantiasis arabum must not be confounded with fibroid enlargements and hypertrophies of the parts, which are more commonly met with in this country than the true disease. In these cases the resemblance is often striking, but some of the conditions are wanting—either the history of inflammatory attacks at the beginning, or the enlarged glands in the groin, or the general diffusion of the tumor, with thickening of the true skin over the growth. The absence of these signs will serve to distinguish it from fibroma diffusum or from simple fibroma, with which it has often been confounded. Virchow states that true elephantiasis never becomes pediculated, but always involves the whole organ. It also contains yellow elastic tissue, which is not true of fibroma in any form.

Treatment.—The principal hope lies in surgical interference, and, fortunately, this can often be successfully offered. Before resorting to the knife it might be well to try the effect of the galvanic current, using galvano-puncture and very powerful currents, from fifty to one hundred milliampères. Some successful cases have been reported. The treatment must be kept up for a long time—one or two years. The most certain results have been obtained by amputating the diseased mass. This does not seem to be either a very difficult or dangerous operation,[1] and is to be conducted on general surgical principles.

Fibroma diffusum.—The disease which I wish to describe under this head has been usually described either as elephantiasis, syphilis, or lupus. Although it resembles all these affections in the hypertrophy

[1] See p. 528.



of tissue, there is certainly a distinct etiological difference, as well as a difference in clinical behavior.

Etiology.—The cause is very obscure. Syphilis has been more generally assigned as a cause than anything else, but its relations to the affection are very uncertain. In two cases seen by the writer, venereal disease was admitted, but from the patient's description, as well as from the absence of other marks of syphilis, the disease was most probably of a chancroidal character. In cases reported by others there has sometimes been a distinct syphilitic history, but this is not universal; and, even granting it, the relation of cause and effect is still unproved. Dr. Matthews Duncan[1] describes a disease as lupus which from the plates, as well as from his descriptions, corresponds with the disease under consideration. He reports a number of cases, but Dr. Thin, who examined his specimens microscopically, declares that they contained no histological elements which would characterize them as either lupus, gummata, cancer, or elephantiasis. In the same discussion Mr. Hutchinson was inclined to regard the cases as being syphilitic in character, but Dr. Galabin reported that he had found in similar cases that, although there might be some evidence of syphilis, the disease did not yield to antisyphilitic treatment alone, but was cured by excision followed by these remedies. Paget, Kaposi, and Vidal are quoted by Duncan as being opposed to the syphilitic origin. Virchow has suggested that the destruction of the inguinal glands by obstructing the flow of lymph might result in a lymphatic œdema of the parts, with dilatation of the lymph-vessels and hypertrophy of the connective tissue. A considerable number of cases have been reported where this has occurred, and a one-sided enlargement has followed the destruction of the glands on the same side. In the two cases seen by the author the glands were destroyed by buboes resulting from chancroidal ulcers. Mayer, however, states that this condition is sometimes wanting. There is no evidence obtainable at the present time that any bacterial cause for the disease has been observed.

With such conflicting testimony we must consider that the cause of this disease is unknown, but that the growths commonly follow some local irritation seems to be probable.

Clinical History.—The disease usually affects women during the period of sexual activity. The parts affected are the labia majora, the clitoris, and the labia minora, in the order named. Often the whole rima vulvæ is affected, the growth forming a distinct collar around the entrance to the vagina, which may thus be nearly closed and the sexual act be entirely prohibited. The growths are usually largest near the clitoris, becoming smaller as they approach the perineum. One side alone may be affected, or the whole supravulvar region be the seat of

[1] *Obstet. Trans.*

the disease. The growths are very irregular, and are broken up into lobes, and often portions form polypoid tumors with distinct pedicles. In other cases the whole growth assumes the shape of a polypus. The surface is usually smooth, lobulated, and may be pink, nearly white, or brownish in color. If covered by the skin, it may be warty and fissured. Ulceration, simple in form and not typical of either syphilis or lupus, often occurs, especially between opposing surfaces, from pressure and friction. Cicatrices are frequently present from old ulcerations. Unless inflamed, the growths are usually insensitive and painless, and do not directly interfere with the general health of the patient. They are, however, a hinderance to coitus, and if large to locomotion, and if ulcerated or inflamed may be very sensitive and painful. They grow slowly as a rule.

Pathological Anatomy.—The substance of the growths is connective tissue in all stages of development. Around the vessels and under the epithelium will be found more or less small cell-infiltration. The skin or mucous membrane is not usually thickened, as in elephantiasis, nor are the walls of the lymphatics or veins thickened and enlarged. There is usually a distinct dilatation of the lymphatic spaces from contained fluid, but without proliferation of the endothelium.

Prognosis.—If left to themselves, these growths last indefinitely, growing slowly or remaining stationary, but do not kill, unless deep ulceration and sloughing take place—a rare occurrence.

Treatment.—The only treatment which seems to offer any chance of success is surgical. In removing the growths several methods are open for choice, the same methods being applicable to operations on elephantiasis. Schroeder proposed to cut a small section at a time from below upward, and to control the hemorrhage by bringing the parts together by deep sutures before cutting farther. This is done a short distance at a time, first on one side, and then on the other, until the whole mass is removed. A number of cases have been successfully operated on by this method. By the use of hæmostatic forceps in plenty, the whole mass, even if large, might be excised at once, and the bleeding points secured as fast as cut. The cautery, either the wire or the thermo-cautery, has also been used, and is safer and prevents any serious loss of blood. In one case the writer followed two plans—cutting and suturing on one side and cauterizing on the other. The result was the same on each side, as the cut side did not unite by primary union, but both healed by granulation. So low is the vitality of the parts that primary union cannot be confidently expected. A good result may be obtained by the method proposed by Mundé, who safely removed a large tumor by passing three needles through the face of the growth and tying an elastic ligature around it. When the elastic ligature was loosened the vessels were seized and tied with silk. Union took place except in the track of the silk

ligatures. Emmet has operated by passing silver sutures entirely behind the growth, and then twisting them as fast as the incision was made, thus controlling the hemorrhage. Smaller tumors have been removed by the elastic ligature alone, a furrow being cut around the neck of the tumor through the skin or mucous membrane, and the ligature placed in the furrow. This might be done in the case of polypoid masses by the aid of cocaine. The possibility of the removal by electrolysis is not to be forgotten.

Fibroma and Fibro-myoma.—Fibroid tumors are quite rare, as distinguished from elephantiasis and fibroma diffusum. They most commonly have their origin in the connective tissue of the labia majora, though other parts of the vulva may be their seat. They are usually small, but have been known to grow to a great size. When large and heavy, they stretch the point of origin, by dragging on it, until they become pediculated. They are usually smooth and rounded, but may be lobulated and irregular. They are composed entirely of connective tissue, and covered by a thin but normal layer of skin or mucous membrane. The skin is usually movable, while the mucous membrane is more apt to be closely adherent to the tissue. In some instances the covering has been converted into a dense capsule.

There are two varieties, the hard and soft—the latter is often called fibroma molluscum—differing only in the amount of fluid contained in the meshes of the connective tissue. There may be a greater or less infiltration of round cells. The tumors often become œdematous during menstruation and pregnancy. Ulceration of the surfaces from friction is not uncommon; inflammation may result and abscesses be formed. As a rule, they grow slowly, and in time may attain a great size.

Myoma.—Tumors of this kind have been occasionally observed on the vulva. They probably have their origin in the few smooth muscle-fibres which are the remains of the round ligament. They differ in no respect, except histologically, from fibromata, and from each other only in the relative amount of smooth muscle-fibre and connective tissue. Dr. Bedford Fenwick[1] has reported a case of lipo-myoma of the left labium.

Symptoms.—The symptoms are mostly due to the weight and size of the mass. Incontinence of urine may occur if the origin is near the meatus, but this is cured by the removal of the tumors. They may hinder coitus and become a great source of annoyance in walking and standing.

Treatment.—These tumors may be removed by the écraseur, elastic ligature, hot wire, knife, or scissors. The hemorrhage is usually slight and the cure complete, as there is no tendency to return.

[1] *Brit. Gynæcological Journ.*, Feb., 1887, p. 465.

Myxoma.—These tumors consist of a tissue which has for its type the umbilical cord, and are therefore soft and yielding. They contain spheroidal, stellate, and fusiform cells, often anastomosing. The intercellular spaces are filled with a soft, gelatinous basement-substance. They are generally mixed with fat, *lipo-myxoma*, or with fibrillary connective tissue, *fibro-myxoma*. The tumors behave much like the fibromata, with the soft variety of which they may be easily confounded. They are usually benign, but sometimes recur, and also undergo sarcomatous degeneration, when of course they become malignant. They seldom grow to any great size, and are very rare.

Lipoma (Fatty Tumors).—These growths usually have their origin in the fatty tissue of the labia majora, but have been found on the mons Veneris and nymphæ. They behave much like fibroids, becoming pedunculated, but grow rapidly, and often reach a great size. Emmet describes one reaching nearly to the knee, between six and seven inches long. The woman carried it in a bag attached to her waist. Stiegelé removed one which weighed ten pounds. Koch extirpated one entire which reached the knees, the woman having already cut off the lower half herself. Goodell met with such a tumor of the left labium majus reaching to the knees.

Diagnosis.—The diagnosis between lipoma and fibroma might offer some difficulties, but this would be of no practical account, as the treatment is the same in each case. In Goodell's case fluctuation seemed so sure that he mistook it for a cyst. From their rapid growth they have also been confounded with sarcomata.

Treatment.—These tumors can be readily removed by separating the pedicle and closing the wound with sutures, or by a process of enucleation after having cut through the integument.

Papilloma.—There are three forms of growth found on the vulva which may be grouped under this head—viz. 1, simple papilloma; 2, pointed condyloma; 3, syphilitic condyloma. The second and third are probably due to certain specific poisons, while the first occurs without assignable cause.

Papilloma Simplex.—Simple non-specific warts are a comparatively rare form of growth on the vulva. They are, however, occasionally met with. They may be multiple, as in a case described by Winckel, where the whole vulvar region was covered with a multitude of small warts, or they may be single, as large as a pea or much larger. They are common on the mons, but are also occasionally found on the labia majora or the nymphæ. I have met with a single example in the latter situation. The growth was low, broad-based, about one quarter of an inch in diameter, and was on the outer edge of the left nympha.

There was no history or sign of venereal disease. It resembled exactly similar growths sometimes found on the tongue. Gillette[1] met with a growth as large as two fists on the labium majus of a girl nine years of age. There was no history of syphilis or of any inflammatory affection. The growth resembled a syphilitic condyloma, but was more prominent. Her sister had a similar affection, and died of septicæmia following its removal.

Histology.—These growths consist of an hypertrophy of the papillæ of the skin or mucous membrane, with a corresponding thickening of the epithelial layer, and an increase of connective tissue underneath. They are sometimes sessile or have short pedicles; the surface is not deeply divided as in the pointed condylomata.

In this division must also be classed the so-called *oozing tumor* of the labia, first described by Sir C. M. Clark. There is no published account, which I can find, of a microscopic examination of such a growth, but descriptions, and a plate in Emmet's work, leave little doubt as to its true histology. Clark describes one as growing on the outside of the labium, which corresponds with Emmet's case. It was raised one-eighth to one-third of an inch above the surface, and was lobulated and fissured. Its peculiarity is that it discharges a great amount of watery fluid from its surface, the amount varying with the weather and state of the patient. It occurs mostly in weak, fat, middle-aged women. Such tumors are very rare, and the name should be dropped, as being based on a peculiarity which is not confined to these growths, and which is not always present. More careful observation is needed on the subject.

Treatment.—If small, the growths may be destroyed by applications of acetic acid, carbolic acid, or other caustics. But, undoubtedly, the best method, when they are large and not very numerous, is to remove them with the scissors or knife under cocaine, and then bring the edges of the wound together with fine sutures. If the growths are quite small and numerous, electrolysis may be used; but if they are large and hemorrhage is feared, the electro-cautery wire may be used, as was successfully done in Gillette's case. The so-called oozing tumors have been successfully removed by cutting, and no return noted.

Pointed Condyloma (*C. acuminata, Venereal Warts, Specific Vegetations*).—It is only within comparatively recent times that the true nature and relation of these growths has been understood. They may grow in all portions of the genital tract, from the cervix uteri to the skin on the perineum and thighs. Their most common seats are the inner surfaces of the labia majora, vestibule, and perineum. They are always multiple, but cases have been seen where a number of growths occurring near together have coalesced into one mass (Hil-

[1] *Am. Journ. Obstet.*, 1879, p. 599.

debrandt), so as to appear like a single growth. They are usually quite small, but masses have been observed as large as a man's hand.[1] When occurring on the skin or mucous surfaces, not subjected to pressure and not too near together, they are found to have a very small base, being polypoid in shape. They are covered with a thick layer of epidermis, which gives them a yellowish or grayish appearance, but when constantly moist they become semi-transparent, bearing, as McClintock observes, a resemblance to the white muscular tissue of fish. Often a number, springing from contiguous surfaces, seem to present a large, broad-based growth, but on careful examination will show a number of separated pedicles, and only an apparent coalescence. On the skin they may be dry and hard, but when springing from a mucous surface and constantly bathed in moisture, they are soft. Those occurring within the vulva and vagina do not so much tend to assume the polypoid form; but the relative smallness of the base can always be observed, and is quite characteristic. The surface of the growth is always divided into small lobules with pointed ends, when not flattened by pressure, like a cock's comb. Sometimes one papilla will be longer than the others, giving a distinctly pointed shape to the whole growth. The differences in appearance and shape are due only to environment.

If pregnancy coexist, the course of the disease is somewhat changed. The warts then grow to a much greater size, and the number is also greatly increased: the vagina is more likely to be affected. In the vagina the warts are usually smaller and more rounded, resembling in some cases granulations. They may cover the whole vaginal mucous membrane, and even invade the cervix, covering its surface, though there is no record of their having entered its cavity. With these growths the discharge from the vagina is usually very profuse. It is stated that after labor the growths rapidly diminish and disappear. This observation we are unable to corroborate, never having seen such a result, and Winckel states that it does not always occur. Whether the growths occur during pregnancy as a result of the irritation of the increased discharge at that time, is unsettled; but in my experience a direct gonorrhœal infection has always been distinctly traceable. Given the infection, the increased formative activity of pregnancy would be enough to account for their rapid growth.

Etiology.—It is all but universally conceded that these growths are due to the poison of gonorrhœa. They have incorrectly been attributed to syphilis, but clearly have not the slightest relationship with that disease, though the two may undoubtedly coexist. Some authorities consider that other irritating discharges, besides those due to gonorrhœa, may be the exciting cause; but this is rendered much less probable now that the characteristics of chronic gonorrhœa are better under-

[1] Massot, *De l'Influence des Traumatismes sur les Grossesse*, Paris, 1873.

stood. That the gonorrhœal poison may exist in the vagina, with an amount of discharge so small as to escape notice, is certain (latent gonorrhœa of Noeggerath); and, this being the case, the poison (germ) may be found in discharges due primarily to cancer, inflammation, or other diseases. It is nearly certain that the presence of an irritating discharge without the specific cause of this disease is not enough to cause the formation of the growths. Further experimentation and observation is necessary to place this among the accepted facts, but enough has been done to render it all but settled. Germs, the gonococci of Neisser, have been found in the growths themselves and in the discharges accompanying them, and efforts have been made at transplantation; but the results have been unsatisfactory and have proved nothing.

Histology.—The warts consist of a very delicate branching framework of connective tissue, containing a few relatively large blood-vessels, covered with a very thick layer of epidermis or epithelium. They have not been observed on surfaces covered with cylindrical epithelium.

Treatment.—Undoubtedly, the speediest mode of cure is to remove the growths. This may be done with scissors, knife, or caustic. If simply cut, a small portion may be left, which will be the seed from which the wart will grow again; but if cut and the base cauterized, a certain cure is arrived at. When they are small, soft, and near together, the sharp spoon may be used with good effect, all bleeding points being afterward touched with caustic or actual cautery. Numerous applications have been advised which have for their object the drying up and gradual destruction of the growths. Among these may be mentioned concentrated carbolic acid, chromic acid (gr. c–ʒj), Fowler's solution. Solutions of corrosive sublimate in alcohol, and corrosive sublimate and collodion (1 : 8), have been highly praised. Glacial acetic acid is very effective, and lastly the tincture of *Thuya occidentalis*. This is asserted to have a specific effect. The parts are to be kept constantly moistened with it. It will be noticed that all these agents are parasiticides.

In the pregnant state, if we accept the specific theory of causation, it is certainly very necessary that the disease should be cured before labor comes on. If the gonorrhœal poison is left in the vagina, there is danger of its extension during the puerperium, and also great danger of ophthalmia for the newborn child. It is, however, impossible to cure the gonorrhœa as long as the warts are left. The first step, then, is to remove them, both from the vulva and from the vagina. In a considerable number of cases the writer has done this at various stages of pregnancy in the following manner: The patient being etherized, the external warts were cut or scraped off, and their bases touched with a point of silver nitrate or red-hot cautery, thus controlling all hemor-

rhage. In the vagina the growths were removed with the finger-nail or sharp spoon. A very large cylindrical speculum was then introduced, and after all blood-clots and discharges had been carefully removed, an ounce of a solution of silver nitrate (ʒj to ɜj) was poured in and the whole surface mopped over as the speculum was gradually withdrawn. This application was repeated once in three days until all discharge had ceased. Any remaining fragments of warts found outside were treated with glacial acetic acid. If the urethra and other passages were infected, they too were treated, as they might be a lurking-place for the poison and the source of a new infection. This method will be found very effective, and in no instance has the course of gestation been interrupted or hemorrhage at all severe.

Very large growths or masses may be removed by the galvano-cautery wire. It is to be remembered, in all cases, that the mere removal of the warts without curing the specific discharge will have only a temporary effect.

Syphilitic condyloma, or mucous patches, are commonly found around the vulva and vagina. They are flat, broad-based, and sometimes coalesce, involving large surfaces. They are generally soft or spongy, and are covered with a grayish secretion like mucus, which is said to consist of softened and broken-down epidermic scales. They have no pedicles, but are broadest at their bases. They are stated (Duhring) "to sometimes take on action which results in the formation of luxuriant, hypertrophic, warty, papillary growths," when they are easily confounded with the venereal wart. Local antisyphilitic treatment soon causes them to disappear.

Cystoma.—Cystic growths are not very uncommonly met with in the vulva. The majority undoubtedly have their origin in the vulvo-vaginal gland; but besides these there are cysts which possibly exist as retention-cysts in Gartner's canal, and others which have their origin in the capsule formed around old blood-clots. Another origin may be found in the enlarged lymphatic spaces (Klob). Besides these, dermoid cysts have been observed,[1] but are extremely rare.

Cysts of the Vulvo-vaginal gland are true retention-cysts, and arise from an obstruction in the duct of the gland, or from a stoppage of the duct leading from a single acinus. They are found in the labia majora in the region of the gland, and are usually round, smooth cysts of varying size, but never reach any great magnitude. One observed by the writer reached the size of an egg in seventeen years. When the whole gland is involved they may be lobulated, corresponding to the structure of the gland.

Cysts found in the upper part of the vulva near the meatus, and

[1] Kirmisson, *An. de Gyn.*, 1874, p. 148.

sometimes extending up the anterior vaginal wall, are thought to have their origin in Gartner's canal, a fœtal structure usually obliterated. The other forms of cyst may be found in any part of the vulva, and are sometimes very deep, extending into the pelvis, or are firmly attached to the bone.

Wen-like tumors formed from the occlusion of sebaceous glands have been reported.

In a case recently brought to me by Dr. W. M. Baker of Warren, Pa., a cyst of the left labium majus, nearly four inches long, projecting in such a way as to greatly resemble a penis, was connected through the inguinal canal with a cyst of the abdomen reaching two-thirds of the way to the umbilicus. The contents was a thin, watery fluid with a good many pus-cells. The cyst broke in the labium and emptied itself entirely. I am not sure as to the nature of the cyst, but think it may be a hydrocele of the round ligament, which extended above the internal abdominal ring and formed the tumor in the abdomen, as the point of least resistance. When the sac in the vulva was open the finger could be passed through the inguinal canal into the cyst above.

The contents of labial cysts is usually a clear, watery fluid. Occasionally it is dark-brown, thick, or even purulent. The walls of the sac are generally thin, but strong, and are lined with epithelium and firmly united with surrounding tissues.

Symptoms.—These cysts grow very slowly, and at first cause no inconvenience; but occasionally they get large enough to interfere with coitus and to cause discomfort, and even pain, in locomotion. They may become inflamed and suppurate, but usually only as the result of mechanical violence.

Diagnosis.—Cyst of the vulva may be confounded with hydrocele, hernia, abscess of the vulvo-vaginal gland, and hernia of the ovary. The diagnosis can generally be made by the feel of the tumor, its situation and insensitiveness, and its long and slow growth. If doubt be felt, tapping with a hypodermic needle is fully justifiable, and will reveal the true nature of the disease.

Treatment.—We may extirpate the cyst by dissecting it carefully from the surrounding tissues. If the cyst be superficial, this is undoubtedly the most satisfactory method; but if it is very deep and large, the operation is likely to be a difficult, if not a severe one, as the hemorrhage is apt to be consideraable. Great care should be taken during the operation not to rupture the cyst. After it is removed the wound should be brought together with deep sutures, so as to get primary union. The method of incising the cyst on its mucous surface, and then destroying its lining membrane with caustic, will give good results; but the healing process is very slow, and the resulting scar quite large. A better plan is to pull up a portion of the sac-wall with a tenaculum, and cut

out a considerable portion with scissors. The interior of the sac can then be painted with iodine and packed with gauze. Withdrawing the fluid with an aspirator, and injecting a few drops of iodine or carbolic acid, will be enough to cause an adhesive inflammation and destruction of the cyst, and is particularly applicable to small growths.

Gaseous Tumor.—Lusk[1] has described a tumor of this kind. It was an abscess of the vulvo-vaginal gland communicating with the rectum. It is interesting from a diagnostic point of view.

Osteoma and Enchondroma.—These tumors have so seldom been seen that they are simply surgical curiosities. Zweifel quotes a case from Schneevogt of enchondroma of the clitoris as large as the fist. He also mentions Beigel's case of ossification of the clitoris as belonging to the same category, as well as a similar case mentioned by Bartolin.

Neuroma.—Simpson[2] states that he has found neuromata or small nodular tumors occurring under the mucous membrane around the urethra, such as are found under the skin in other parts of the body. He advises their extirpation, as the only hope of relief. Jackson[3] has described a similar case.

Kennedy[4] describes certain "sensitive papillæ and warts" which, he says, are exquisitely painful and often very small. They were found on the labia minora and in the vestibule, and occurred after labor, from imperfectly-cured ulcerations. He advises removal with the scissors.

Angioma.—Sänger[5] reports a case of congenital angioma in a child ten weeks old. The right labium majus was affected. The tumor was like a cock's comb, 3 cm. high, 1.5 cm. broad, and 1 cm. thick. It had grown rapidly since birth. Hennig met with a similar case in a child two years old. Sänger's case was perfectly cured by excision and suture. Some fibroids have a more or less angiomatous structure. Thomas describes a disease affecting the urethro-vaginal tubercle to which he gives the name of "urethral venous angioma." It closely resembles irritable caruncle, but is to be distinguished from it by its want of sensitiveness.

Melanoma.—Several cases[6] of this kind have been reported, generally as melano-sarcoma. The tumor may be extirpated, but will be

[1] *Am. Journ. Obstet.*, 1880, p. 389.
[2] *Works*, 1872, p. 784.
[3] See article on "Sterility."
[4] *Med. Press and Circ.*, June 7, 1874.
[5] *Centralbl. f. Gyn.*, 1882, p. 175.
[6] H. Green, *N. Y. Journ. of Med.*, 1844, ii. p. 323; Müller (for Martin), *Berl. klin. Wochenschrift*, 1881, No. 31; *Bull. Soc. Anat. de Nantes*, 1878–79.

quite likely to return, though Martin's second case is reported to have been cured.

Sarcoma.—Sarcoma of the vulva is fortunately among the rarest forms of new growth found in this situation. Winckel[1] reports but 2 among 100,000 gynecological cases. Gurlt's statistics show, among 483 cases of sarcoma, 1 of the urethra, 3 of the rectum, 1 of the vagina, 8 of the uterus and ovary, 150 in the breast, and none in the vulva. His observations extended over twenty-four years, and included 11,140 women with tumors.

There are scarcely enough cases recorded to enable us to draw a clear picture of the disease. In some instances it seems to be originally a pediculated tumor without ulceration. Such was the appearance in a case seen by the writer. The rate of growth is often very slow, and the tumor may be mistaken for a pediculated lipoma (Winckel) or fibroma. In other cases the tumor breaks down and forms an ulcer, which rapidly extends until the whole vulva may be involved (Hildebrandt). There is generally a marked tendency to hemorrhage, which reduces the patient very fast, even when the tumor is quite small. Soft and spongy tumors are particularly apt to bleed.

The varieties of sarcoma which have been met with are the round cell, spindle cell, melanotic, and myxo-sarcoma.

The *prognosis* is exceedingly bad, as in every case so far reported, sooner or later, there has been a return and a fatal result. In the spindle-cell variety early and complete extirpation might result in a cure.

Treatment.—The only thing to be done is to at once remove the growth as completely as possible, either by the knife or the cautery. The rules for operating are the same as for other tumors of the vulva.

Cancer.—*Frequency.*—Cancerous disease in the vulva is more frequent than sarcoma. Meyer places the relative frequency of tumors on the sexual organs as follows: Uterus first; then breast, ovaries, vagina, and vulva, in the order named. Gurlt[2] found, among 16,637 tumors, 11,140 of the sexual organs; of these, 7479 were cancer, of which 72 only were on the vulva. A large share of all malignant tumors of the vulva are epitheliomata.

Varieties.—We commonly divide cancer into two forms—carcinoma and epithelioma. These differ somewhat in their anatomical structure, and also in the mode of growth as well as in prognosis.

Epithelioma (cancroid) is by far the commonest. The tumors are distinguished microscopically by the peculiar arrangement of their cells. Besides containing cells which resemble the normal epithelium of the part in which they originate, they also contain, in the alveoli of

[1] *Pathologie d. Weib. Sexualorgane.* [2] Quoted by Winckel, *loc. cit.*

the connective-tissue stroma, or within the lymph-spaces, numerous nests or "epithelial pearls." These nests consist of collections of thin, dry, horny cells resembling epidermic cells, and are often visible to the naked eye, as they are of a yellowish color. The sebaceous glands are usually implicated in the general proliferation, and show under the microscope masses made up of their characteristic epithelium. These tumors tend commonly to remain near the surface, and to extend above it in the form of papillary masses, rather than to infiltrate the deeper tissues. The surface is generally necrosed, forming ulcers.

Seat.—The most common seat is a question of dispute, but any portion of the vulva or mons is liable to be affected; the labia majora, especially the upper third, and less often the clitoris, being quite commonly attacked.

Clinical History.—The growth begins usually with one or more nodules, which are under the skin or mucous membrane, but to which the overlying tissues are firmly attached. The epithelium over the tumor is at first generally thickened, so as sometimes to form a sort of callosity (Mayer), though it must not be forgotten that such a thickening of the epidermis may occur independently of epithelioma. The nodules may reach a considerable size and invade the deeper tissues before ulceration begins; but sooner or later this characteristic sign shows itself. The growth now extends in every direction, the ulcerated surface growing with it. New papillæ appear through the ulcer, forming fungating masses. The usual tendency to decomposition of the discharges is not so marked as when the growth occurs within a closed cavity, as the vagina. The disease remains as a local affection for a comparatively long time, though portions lying against the diseased surface may be infected (Zweifel). Enlargement of the inguinal glands on the affected side occurs late in the disease. In the beginning the growth attracts but little attention: there may be some burning and itching, or difficulty or pain in micturition, and the patient may discover it only by accident, when scratching or washing herself. After ulceration has set in the course of the disease is more rapid, and death follows usually within two years (Zweifel). Pain may be entirely absent through the whole course, or it may be one of the most prominent symptoms. Death occurs from exhaustion due to septic infection; severe hemorrhages are rare.

Cause.—Of this we know nothing. The age of the patient seems to have a predisposing influence. The larger number of cases occur between the fiftieth and sixtieth years, and about an equal number in each of the decades immediately preceding and following. Local irritation, as from a fall, a blow, or long-continued itching, has been assigned as a cause.

Diagnosis.—The diseases most likely to be confounded with epithe-

lioma are lupus and syphilis. The history of the case will, however, enable us to distinguish between them in almost every instance. Syphilis will have been preceded by other manifestations of the disease; while the long chronic course of lupus, the absence of pain, the cicatrization coincident with ulceration, the absence of the characteristic watery, foul discharge, and the general good health of the patient will serve to distinguish that affection. In epithelioma the ulcer spreads rapidly; the edges are hard and livid; the base is softer than the edges; and the surface is covered by dirty, broken-down tissue, through which projections and papillæ of newly-formed tissue may appear. There is no tendency to cicatrization; later on the inguinal glands become affected, which is not the case in lupus, while in syphilis the enlargement occurs very early or even antedates the ulceration. If doubt exist, a microscopic examination of a small piece will settle the question.

Prognosis.—The prognosis is hopeless unless the tumor is completely removed at a very early stage. The course of this affection is chronic, running as long as two or three years; sometimes it is much more rapid. Recurrence after removal may be delayed for a number of years or may never happen. If the whole disease is not removed at the time of operation, it returns at an early date.

Treatment.—There is but one plan which offers any hope of cure, and that is complete and early removal. This may be done by caustic, actual cautery, or the knife. The elastic ligature has also been proposed. The knife, followed or not as the case may be by further destruction of tissue, offers the best chance. The application of the thermo-cautery to a large ulcerating surface has in my hands only been followed by an increase of pain and a more rapid growth of the tumor. It is impossible to thoroughly destroy the growth in this way. If so situated that the knife cannot be used, a caustic paste would seem to offer the best chance of deeply destroying the mass. When the inguinal glands are involved, Kustner[1] advocates their removal, even opening the ligamenta lata and dissecting out all the diseased structures. If the primary affection can be entirely eradicated, thus giving hopes of a cure, it would seem decidedly best to follow his suggestion; but as the enlargement of the glands usually takes place late in the disease, when the chances of entire removal are small, the adoption of this plan will not often be likely to be followed by benefit. It adds to the difficulties, but not much to the danger, of the operation.

Carcinoma.—Under this head we have two forms—medullary or soft cancer, and scirrhus or hard cancer, also called atrophic cancer and fibro-carcinoma. Melanotic cancer has also been observed (Klob and others). All of these forms are very rare. They occur primarily on

[1] *Zeitsch. f. Geburts. und Gyn.*, vol. vii., 1881.

the labia majora, and with relative frequency on the clitoris, and generally in women upward of sixty years of age.

In true cancer the epithelial cells fail of any special characteristic shape, but may be of all sorts of irregular forms. The cells are packed together irregularly in follicles or cavities in the midst of a connective-tissue stroma. It is the relative amount of connective tissue which makes a hard or soft cancer. It begins deeper in the tissues than cancroid, and extends widely and deeply before breaking down. It always forms projecting masses. The ulcers are covered with foul discharge and broken-down tissue. There is considerable tendency to hemorrhage, especially in the soft variety, and pain is usually much more severe than in epithelioma.

The *prognosis* is eminently unfavorable. Hildebrandt stated that he was able to operate in two cases at a very early stage, but without success. The disease returned in the scar. The lymphatic glands are affected easily. Still, if seen in the beginning, an operation for the complete removal is not only justifiable, but imperatively demanded.

THE INFLAMMATORY AFFECTIONS OF THE UTERUS.

By CHAUNCEY D. PALMER, M. D.,
Cincinnati, O.

Acute Endometritis.

Definition and Synonyms.—*Acute endometritis* signifies an acute inflammation of the mucous lining of the uterus (endometrium). It has been called acute uterine leucorrhœa, or catarrh, and acute internal metritis.

Pathological Anatomy.—There is a turgescence of the vessels of the mucous membrane, with infiltration of serum, and even lymph-cells, within its tissues, consequent œdema and softening. Accompanying these there is more or less catarrh of the mucous surfaces, possessing features of the secretion of (*a*) the cervical canal, which at first is transparent and vitreous, afterward turbid and muco-purulent; (*b*) of the cavity of the uterine body, which is thinner, more serous, then purulent, and often streaked with blood. An abundant formation and desquamation of epithelial cells, exfoliated pieces of mucous membrane, casts of utricular glands, with an escape from the vessels of lymph-cells and a few red blood-corpuscles, characterize the morphological elements of the catarrhal fluid. According to Scanzoni, the surface is often, at portions corresponding to the openings of the utricular glands, covered with bright red spots encompassed by a network of deeply-injected capillaries. In severer cases the submucous layers of the parenchyma become hyperæmic, softened, and pulpy. The os externum becomes tumid, the labia puffy, deprived of epithelium, and present the appearance of erosion. The uterine cavity is increased in size.

The best opportunities for studying acute endometritis in the dead-house occur in fatal cases of the acute exanthemata. The extent of the surface involved varies considerably in different cases, and is much modified by the causative influence.

The disease may be limited to the cavity of the cervix and the region of the os externum, to the cavity of the body, or it may extend throughout the whole uterine canal.

Frequency.—Concerning this point there is a wide difference of opinion among prominent authorities. By some, Klob, Thomas, Priestley, Edis, and Barnes, it is regarded as a frequent affection. By others, Schroeder and Byford, it is thought to be rare. Without doubt, it is not found prior to puberty, and probably the corporeal mucous membrane is more often attacked than the cervical. When we consider the accessibility of the endometrium to external agencies and injuries, not only in parturition and in the lying-in, but also in the non-gravid state, the liability to the upward extension of specific inflammation of the vagina, together with the special physiological vascularity of its tissues, oft recurring, it would seem a matter of surprise that any one could doubt the frequent occurrence of endometritis as an acute affection. There is every reason to believe that the disease is often overlooked until it has subsided into the chronic stage.

Etiology.—1. *Traumatic Causes.*—Under this head are included direct injuries to the uterus by excessive coitus, the use of sounds, tents, intra-uterine pessaries, the operation of incision of the cervix, removal of intra-uterine growths, the use of the curette, and intra-uterine injections. Carelessness in the use of vaginal injections may likewise be so classified.

2. Certain chemicals, as caustics, the local action of which is violent; for instance, the introduction of a crayon of pure nitrate of silver within the uterine cavity is liable to excite inflammatory mischief of the endometrium.

3. Extension of gonorrhœal inflammation from the vulva and vagina may be ranked as among the most frequent and serious of causes. This form of the disease is too frequently not limited to this territory, but extends farther, through the Fallopian tubes and to the pelvic peritoneum, producing what M. Bernutz so aptly called "female orchitis." Vaginitis of a non-specific character does not possess this tendency to extension.

4. Sudden suppression of the menstrual flux from cold or mental excitement.

5. The progress of the exanthematous fevers, rubeola, scarlatina, variola, also of typhoid fever, cholera, and phosphorus-poisoning, sometimes so operates. Kiwisch has spoken of "metastatic constitutional catarrh," referring to this class of cases.

6. The introduction of putrid materials from without, as well as the decomposition of substances, solid and fluid, within the uterus, as the products of conception, remains of tumors, retained menstrual fluid, etc., is an active exciting cause.

In the puerperal form of the disease the origin of the mischief is probably the placental site. Aside from the local injury by contusion and laceration received in parturition, the septic factor, whether auto-

genetic or heterogenetic, is the most important. Acute puerperal endometritis is usually septic in character.

A study of the etiology makes it clear that in most instances the inflammatory action is necessarily extended throughout the organ. Acute endometritis is, as a rule, general.

Symptomatology.—When arising from traumatic or septic causes the disease may be ushered in by a rigor, not so pronounced as in periuterine inflammations, followed by febrile phenomena. The local symptoms are pain of a dull, aching kind, with dragging sensations within the pelvis and back; there is tenderness over the hypogastric region; there may be rectal and vesical tenesmus. Rarely are the symptoms of a violent character. Should the vesical irritation be prominent and the other symptoms be ill defined, the affection may be taken for cystitis. Sudden attacks of diarrhœa from reflex irritation of the rectal nerves are occasionally manifest. The discharge per vaginam is at first slight and serous; in a day or two more free and mucous; then mucopurulent or purulent, and sometimes bloody. It is offensive in septic cases, and at times so acrid as to occasion excoriation of the vaginal and vulvar surfaces, with an aggravating pruritus.

Physical Signs.—On digital examination the os will be found to be more or less open, the cervix somewhat swollen, the uterus tender, softened, and slightly enlarged. Its position is lower within the pelvis. Bimanual exploration confirms these signs. The speculum shows the cervix swollen, red or livid, œdematous, eroded. If the inflammation is confined to the upper cavity, no special change in the cervix is noticeable, save perhaps a slight alteration in the color of its mucous membrane. In all cases the characteristic discharges will be seen pouring from the cervical canal.

The above signs having been detected, the probe or sound ought not to be employed, for its introduction is attended with pain and an aggravation of the existing disease. Nor should the speculum even be introduced if the digital examination detects pronounced tenderness of the uterus.

Diagnosis.—Acute endometritis is to be differentiated from acute vaginitis, pelvic cellulitis, pelvic peritonitis, and metritis proper. Any or all of these may complicate it. From the first it is easily diagnosticated by a greater general disturbance and pain, a different location of tenderness, the character of the discharge, and the presence of the signs referred to.

Pelvic cellulitis and peritonitis are each more frequently ushered in with a rigor, followed by a higher temperature, greater constitutional disturbance, together with more severe local pain and tenderness. Besides, in these two periuterine inflammations the presence of infiltrations around the cervix above the vaginal vault, a consequent displacement

and diminished mobility of the uterus, are changes which in a few days are so well defined that clearness in diagnosis is established. Both of these affections uncomplicated are unaccompanied with any special uterine catarrh, though menorrhagia or metrorrhagia is a frequent attendant.

The diagnosis between acute endometritis and metritis proper will be referred to hereafter.

Prognosis.—Acute endometritis is, ordinarily, not an affection dangerous to life. Mild cases are recovered from, the existence of which has hardly been suspected. Prognosis is most grave in the septic and traumatic varieties, the unfavorable elements being the supervention of general septicæmia and the extension of the inflammation through the Fallopian tubes to the pelvic and general peritoneum. When gonorrhœa enters into the causation the disease is exceedingly prone to this extension and indefinite continuance.

A sound constitution, free from diathesis, favors a speedy recovery. As the uterine mucous membrane is quickly degenerated, so with favorable general health it is actively regenerated. Therefore, the most unfavorable aspect of acute endometritis is the marked tendency in many constitutions for it to become a chronic disease.

A strumous, tubercular, or syphilitic diathesis, a condition of anæmia or impaired general health at the time of the inception of the disease, favor its perpetuation. Recovery is often only partial when it is supposed to be complete. Successive menstrual approaches tend to rekindle the symptoms. We can be certain of the accomplishment of a cure only when one or two such periods have been passed without relapses.

Treatment.—The first and most important indication of treatment is *rest*. In the recumbent posture the affected organ is placed at rest, pain is mitigated, and the pelvic circulation favorably modified. The suggestion of rest becomes unnecessary in severe cases, but in the milder forms of the disease, when the patients are going about or on their feet, the injunction is imperative. Rest is to be maintained so long as there are pelvic pain and uterine tenderness. Precaution is essential at the approach and during the first and second succeeding menstrual epochs. Rest and the absence of pain are likewise secured by the administration of opium in some of its forms. For this purpose a very desirable channel for medication is the rectum. Ordinarily, in this way it requires a quantity of the drug slightly in excess of the dose by the stomach to obtain the desired effect. A suppository of morphina sulphate (gr. $\frac{1}{6}$—$\frac{1}{4}$) is to be introduced every few hours if pain is present. The rectum should be unloaded of any fecal accumulation by an enema or a mild saline cathartic. Active purgation is always to be avoided.

The febrile movement is controlled by the above-mentioned means

and the internal administration of the tincture of aconite or veratrum. Norwood's tincture of veratrum viride in small doses is a valuable agent to regulate the circulation and febrile symptoms in all the acute pelvic inflammations. Its use is contraindicated only in cases of marked asthenia or after septic absorption.

The diet should be easy of digestion but supporting; concentrated foods, as beef-juice and milk, are the best.

The local abstraction of blood by leeches or otherwise, the use of mercurials in any stage of the disease, are not only unnecessary, but prejudicial to a speedy recovery. Reference, of course, is not made to those cases complicated with periuterine inflammations, in which one or both of these agents may be especially indicated.

Fomentations are always grateful to the patient. There is no more convenient or efficacious means of applying heat and moisture than by a hot flaxseed poultice, the prepared material spread between thick muslin and mosquito netting, covered with oiled silk, the whole poultice large enough to envelop the entire abdomen.

Vaginal injections, with water in large quantities, as hot as can be borne (100°–120° F.), projected against the cervix and the surrounding vaginal vault, with the patient on the back, the pelvis higher than the shoulders, the current of water being received into a vessel at the side of the bed by means of a rubber blanket, keep the cervix and vagina clean, prevent secondary vaginitis and vulvar pruritus, and act as poultices to the interior of the pelvis. These injections should be repeated from two to four times a day. Beyond this no local treatment is required.

Septic endometritis, arising from a retained ovum, placenta, clots of blood, or remains of disintegrating tissues, demands the local employment of antiseptics, as carbolic acid, boric acid, bichloride of mercury, or permanganate of potash. The bichloride (1 : 2000–8000) is the best known parasiticide. In all cases with offensive discharges the injected solution within the vagina should contain one of these remedies; and in those with symptoms of systemic absorption, manifest or threatened, the same kind of solution, though weaker, is to be carried within the uterine cavity. It must be admitted that certain risks attend intrauterine injections, even under the circumstances of a large uterus, a patulous canal, and a free exit for the fluid. But the risks are not great. Compared with the dangers of septic absorption, or the urgency for the removal and disinfection of septic matter, fresh invoices of which by a continuous or intermittent imbibition into the vascular system are being kept up, these risks are very small indeed. Fortunately, the uterus is in a condition less susceptible to these risks of shocks, retention of the fluid and distension of the cavity, the passage of the same into the peritoneal cavity, etc., when the urgency for

the employment of antiseptic injections is greatest. Nevertheless, the utmost precaution ought to be instituted. The fluid is to be warmed, injected slowly and without force, and the instrument conveying the current so constructed as to permit a ready exit of the stream. The canula of the author (Fig. 179) will be found useful. The frequency

FIG. 179.

Palmer's Reflex-current Canula, for washing out the uterus.

(one to four times per diem) of these injections is determined by the amount of local sepsis, together with the general septicæmic phenomena.

The general treatment also demands modification in septic cases. Quinina in large doses (grs. XX–XXX), to reduce high temperatures, to antagonize the poison after its absorption, and to support the vital powers, is strongly recommended. Alcohol, acting in the same manner, is of immense value. It is to be given in large doses also. Quinina in tonic doses is always beneficial in the stage of convalescence of all varieties of acute endometritis.

ACUTE METRITIS.

Acute metritis, or *acute parenchymatous metritis*, signifies an acute inflammation of the fibrous structure of the uterus. In speaking of the subject of acute endometritis reference was made to the fact that the uterine parenchyma sometimes becomes involved in the inflammatory changes occurring in the endometrium. Unquestionably, these changes in the contiguous layers always occur in severe endometritis. Likewise, when the serous envelope is affected in acute pelvic peritonitis the inflammation dips down into the subperitoneal parenchyma.

FREQUENCY.—It is a matter of disputation whether acute metritis ever exists as an independent affection. If we are to accept the testimony of the dead-house, the only reliable witness, the question must be decided in the negative.

Klob says: "Inflammation of the substance of the non-gravid uterus seems to be one of the rarest affections to which this organ is liable. I have not met with a single case which, with any degree of certainty, I could pronounce to be one of genuine metritis." Rokitansky remarks that "in acute inflammation of this organ generally the lining membrane of the uterus is affected primarily, and that this is scarcely ever the

case with the uterine tissue, as far as can be demonstrated by the pathological anatomist, with the exception of the reaction following traumatic influences, especially of the vaginal portion." Schroeder, who contends for its occurrence, admits that it is a very rare disease, and always complicated with acute endometritis. Thomas no longer devotes an independent chapter to the subject, and regards metritis merely as a complication of endometritis. As this author pertinently remarks, with the light of the present state of knowledge acute parenchymatous metritis should be placed in a subordinate instead of a prominent place in uterine pathology. The descriptions of most of the older authorities have been transferred to us as matter of literary tradition, and not clinical research.

What Virchow designated as "diffuse puerperal metritis"—a puerperal form of inflammation prevailing when certain epidemic influences are at work, possessing great resemblances to erysipelas on the surface of the body—is in all probability endometritic, and not metritic.

The following propositions, in the light of modern investigations post-mortem and at the bedside, may be deduced:

1. Most cases of supposed metritis are instances of inflammation of the endometrium or the periuterine tissues.

2. Localized metritis, contiguous to the mucous layer, is resultant, not unfrequently, on severe endometritis.

3. Parenchymatous metritis, complicated with and resultant on endometritis, is more frequent and extended in the puerperal than the non-gravid organ.

4. Pure and uncomplicated parenchymatous metritis rarely, if ever, occurs.

Pathological Anatomy.—The changes which are noticeable are hyperæmia, tumefaction, and infiltration with serum. The uterine walls are succulent, softened, and at times ecchymosed. Small collections of pus-corpuscles may be found between the muscular fasciculi and in the uterine veins. Abscesses of any dimensions are extremely rare even when puerperal. A uterine abscess may perforate, and, according to its situation, open into the uterine or vaginal cavity, or outwardly into the peritoneal cavity, or if proper adhesions are formed into the intestines. Cases of perforating abscesses have been described by Kiwisch, Scanzoni, Bird, Reinmann, and many others. These abscesses sometimes depart from their usual course, and instead of evacuating in the surrounding cavities the incarcerated pus undergoes caseous, fatty, or calcareous degeneration, then absorption, or becomes enclosed in a cavity by a growth of the surrounding connective tissue.

Puerperal metritis is frequently associated with lymphangitis and phlebitis and their sequelæ. Sometimes the peritoneal envelope of the

uterus is covered with fibrinous exudations. All the changes in the uterine walls are most marked nearest the mucous membrane.

The disease may terminate (*a*) in resolution with absorption of the exudation; (*b*) in proliferation of the connective tissue with permanent enlargement; (*c*) in induration and atrophy.

It is most probable that the condition of the uterus called superinvolution, first described by Simpson, is resultant on acute parenchymatous metritis in the puerperal state.

Etiology.—Acute metrititis is developed either as an extension of endometritis, or it arises from lesions in the puerperal bed.

Symptoms and Signs.—Though more severe, the symptoms are the same as in acute endometritis, with which it is probably always associated. To touch and bimanual examination the uterine body, especially in its antero-posterior diameter, is much enlarged, somewhat doughy, and very tender.

Diagnosis.—The marked enlargement and sensitiveness of the uterus are the reliable local evidences. They are associated with the general febrile phenomena. Small collections of pus cannot be recognized. Larger accumulations may be diagnosticated by the gradual increase in the size of the organ, a localized elasticity of its tissues, if not fluctuation.

Prognosis.—The prognosis is more grave than in pure endometritis.

Treatment.—The same principles of treatment laid down for acute endometritis are also applicable to acute metritis.

Bibliography.

Barnes, R.: *Diseases of Women*, 2d ed.
Bernutz and Goupil: *Diseases of Women*, translated for New Sydenham Soc. (1857).
Byford, W. H.: *Medicine and Surgery Applied to Women*, 3d ed.
Edis, A. W.: *Diseases of Women* (1882).
Kiwisch: *Klinik Vorträge.*
Klob: *Pathological Anatomy of Female Sexual Organs.*
Priestley, W. O.: *Reynolds's System of Medicine*, vol. v.
Rokitansky: *Pathological Anatomy.*
Scanzoni: *Diseases of Females.*
Schroeder, C.: *Diseases of Female Sexual Organs* (Ziemssen's).
Simpson, Sir Jas. Y.: *Works of*, vol. iii.
Thomas, T. G.: *Diseases of Women*, 5th ed. (1880).

Chronic Endometritis.

As does acute, so chronic inflammation also may attack the different tissues and parts of the uterus. While acute inflammation is noted for the suddenness of its inception, the rapidity of its progress, and its com-

paratively short duration, chronic inflammations, on the other hand, are manifested by their insidious inception, slow progress, long duration, and comparatively mild symptoms.

Definition and Synonyms.—Chronic endometritis signifies a chronic inflammation of the lining mucous membrane of the uterus, and is known by the name of chronic uterine leucorrhœa or catarrh. Confined to the cervical canal, it has been called by the hybrid term, "chronic endocervicitis," also "cervicitis," but inappropriately. The term "endotrachelitis" is proper, and that of "chronic cervical endometritis" defines very correctly both the nature and the seat of the affection when the cervical canal alone is involved. Limited to the corporeal cavity of the uterus, the disease has been entitled "chronic internal metritis," also "fundal endometritis." But for reasons just stated this form of the disease is best known by the appellation of "chronic corporeal endometritis."

Divisions.—Three varieties of chronic endometritis are recognized, a division which clinical experience and post-mortem examination sanction. Thus:

1. Chronic cervical endometritis;
2. Chronic general endometritis;
3. Chronic corporeal endometritis.

This is the order of frequency of the different varieties.

It has been observed for a long time—a point persistently held by Bennet—that chronic inflammation very often confines itself to one portion of the uterus, especially the cervix, without invading the other. Various reasons have been assigned for this peculiarity of self-limitation of the chronic type of the disease, which does not hold true in the acute. For the most part, these reasons pertain to the differences, both anatomical and physiological, between the cervix and corpus uteri. The decided distinction in the pathological proclivities of the two parts is also evidenced by the frequent sharp limitation of tubercular disease to the body, and cancerous disease to the neck, of the uterus.

The three forms of chronic endometritis will now be considered in their order.

CHRONIC CERVICAL ENDOMETRITIS.

Frequency.—It is more than probable that chronic inflammation of the mucous membrane of the cervical canal and the exterior of the infravaginal cervix is the most frequent disease of the female pelvic organs. A vast majority of all women seeking advice for chronic pelvic disease have this affection, either independently or complicating some other. Considering the position of the cervix, its exposure to injury in coitus and parturition, this statement excites no surprise. Chronic catarrh of the cervical canal is infinitely more frequent than of the upper uterine cavity.

Pathological Anatomy.—Chronic cervical endometritis is essentially a glandular disease. The first step in the pathology is a hyperæmia of the peculiar follicles of the cervical canal, the glands of Naboth. These become swollen, enlarged, elevated, with dilated mouths, and in consequence there is a hypersecretion from them. Increased is soon followed by an altered secretion. At first it is thin, glairy, alkaline, like the white of an egg; then it becomes thicker, more tenacious, and adhesive; later, decidedly albuminous, loaded with epithelial cells; and finally it may be yellow and tinged with blood. Within the vagina, owing to an acid secretion, the discharge sometimes assumes the appearance of coagulated white of egg. Another feature of its altered character is its acridity, exercising a manifest erosive influence on the surrounding cervical mucous membrane, already softened and hyperæmic. Thus, an increased and altered secretion produces disintegration of the epithelial layers, and creates what is known as *abrasion* or *erosion* (Plate II. figs. 1, 2), the most superficial form of ulceration. For the most part this erosive process is noticeable in the region of the os externum, but may extend up the cervical canal.

The disease progressing, it begins to effect changes in the mucous membrane proper, already denuded of epithelium. In the papillæ a proliferative inflammation occurs. These papillæ undergo hypertrophy, constituting a process known as granular degeneration or the granular ulcer (Plate II. fig. 3). The labia uteri are now tumid, pointing, the os externum patulous; the whole cervical canal is larger, and loses in a measure its natural fusiform shape. In some instances the constant catarrh with an attendant tenesmus leads to eversion of the cervical mucous membrane. Should the inflammatory action progress still farther, a well-defined or true inflammatory ulcer would be formed. While such a result is possible, it is among the rarest of occurrences.

Localization of the disease in the muciparous follicles of the infravaginal cervix creates enlargement in them, distension, bursting, a follicular ulceration (Plate II. fig. 4)—a process which in its entirety is called cystic degeneration. Hypertrophy of the Nabothian glands may be carried to such an extent that, either singly or in aggregation, they partake of the shape of polypi. In old cases hyperplasia of the mucous membrane and adjacent fibrous tissue may be noticeable.

The steps, then, in the pathogenesis of the disease are—

1. Increased and altered secretion, incident to the changes in the Nabothian glands.
2. Erosion of the epithelium.
3. Granular degeneration of the villi of the mucous membrane.
4. Dilatation of the os externum and lower cervical canal.
5. Eversion of the cervical mucous membrane.

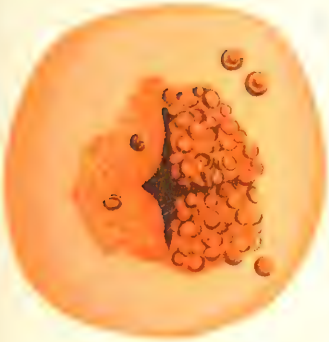


Fig. 1. Erosion of the Cervix. (Meigs.)
Fig. 2. Follicular Erosion with slight Laceration. (Meigs.)
Fig. 3. Granular Degeneration of an Elongated Cervix. (Meigs.)
Fig. 4. Erosion. Cystic Exfoliation. (Meigs.)

6. Follicular ulceration and degeneration.

It must not be inferred that all or most of these changes are exhibited in every case, for they are not. Indeed, in a certain few all that can be noticed on the most careful inspection through the speculum is the characteristic discharge issuing from the os externum, the infravaginal cervix appearing perfectly normal[1]

Etiology.—It is not only proper, but necessary, in a full consideration of the etiology of this disease, to study the causes under two heads, predisposing and exciting. The former are usually general or constitutional, and the latter local.

A. *Predisposing Causes.*—Under this heading are included—1. The various diatheses and blood-disorders, as scrofula, tuberculosis, syphilis, rheumatism, gout, rheumatic gout, anæmia, chlorosis, leukæmia, chronic albuminuria, malarial poisoning, etc. In most of these affections the mucous membranes of the body in general show a special tendency to local manifestations of the general state, that of the uterus being by no means the only surface affected, chronic pharyngitis, bronchial or gastric catarrh, granular eyelids, for instance, being present. Chronic uterine catarrh is exceedingly common in phthisical and strumous subjects.

2. A Natural or Acquired Feebleness of Constitution.—Good general health is, as a rule, essential for a healthy sexual system. A poor inheritance, an arrested or imperfect physical development, tend to make one liable to local affections. It is a matter of common observation that certain temperaments, notably the lymphatic, and females of the blonde complexion, are the most frequent subjects of leucorrhœa.

All those diseases and modes of life which depreciate and undermine the general health predispose to mucous inflammation of the uterus. A cervical catarrh may first manifest itself during the convalescence of some acute affection. This local disease too frequently insidiously develops in women from bad hygiene, close confinement indoors, indolent habits, insufficient and improper food, false habits of dress, fashionable dissipation, etc., through the impress these means make in enfeebling the general health. Nutrition becomes faulty, the balance between waste and repair is lost, the blood is impoverished, and function is disturbed.

In a like manner, on the nervous system the depressing effects of grief, as well as the pernicious influence of our modern system of schooling girls in their most important years of growth, may operate. It is a lamentable fact that the health of thousands of our American

[1] The foregoing represents the status of the pathological conditions as generally accepted until some most recent investigations made by Ruge and Veit have taken exceptions concerning part of them. The author has preferred to embody these views in full under the heading of "Degenerations of the Cervix."

girls is broken during the last years of an arduous school-life, never to be fully regained, and the seeds of some pelvic disease sown, never to be entirely eradicated.

Prolonged and excessive lactation, frequent childbearing, favor the development of chronic uterine disease, doubtless owing to the exhausting effects of the drain on the general health which an undue performance of these functions involves.

Many of the well-known exciting causes may utterly fail to bring about local disease without some constitutional morbific force operative in the background. In this way a discovery of one's actual standard of general health is revealed. As Paget expresses it, "The intensity or quantity of a constitutional disease or disposition to disease may be estimated as in inverse proportion to the amount of disturbance requisite to bring about a local manifestation."

Very many diseases and injuries severely test and accurately estimate the degree of imperfection, so to speak, of constitutions. Local pathological changes in a constitution where the standard of health is at par should be in proportion to the local exciting causes. Recoveries from such should be regular in time and method. Deviations therefrom exist only from some constitutional wrong.

B. *Exciting Causes.*—Chronic inflammation of the cervical mucous membrane frequently follows the acute, puerperal or non-puerperal, from which recovery is not complete, either on account of neglect, bad management, or some vice of the general system. It may be an extension downwardly of an inflammation within the upper uterine cavity, or upwardly, from the vagina, especially in the specific forms of the disease.

The newly-married, and more particularly prostitutes, often suffer from this disease as a result of an abuse of the sexual function. The use of cold-water vaginal injections and various other methods to prevent impregnation and produce abortion are fruitful sources of the disease.

Injuries to the cervix in parturition, and in the non-gravid state from the use of sounds, tents, and pessaries, are prominent pathological factors. Among them none are more potent than lacerations of the cervix in parturition, especially if well defined, bilateral, multiple, or stellate. Very often, indeed, lacerations of the cervix are not recognized at the time of the accident, consequently no attention is directed thereto to secure union. Healing is imperfect, and the cervix is left in a condition of persistent irritation and inflammation.

Symptomatology.—Chronic cervical endometritis is often so slow and insidious in its inception and progress that the disease may continue for some time without the presence of any special symptoms denoting its existence.

The local symptoms will usually be first manifest. Among these prominently stands leucorrhœa. Its recognition by the patient depends largely upon her habits of personal cleanliness. Patients will sometimes say there is no leucorrhœa when a speculum examination reveals its presence in great abundance. The discharge is thick, viscid, tenacious, highly albuminous, and, in severe cases, muco-purulent or tinged with blood. As it pours forth from the vagina it sometimes assumes a coagulated appearance. It is always present, and usually the quantity is in proportion to the activity and extent of the local disease.

The next symptom is pain in the pelvic region, the kind, degree, and exact seat being subject to much variation. Ordinarily, the first manifestation of pain is backache in the sacral and lumbar regions, and then dragging sensations in the hypogastrium, increased by standing, walking, and during menstruation. Coitus becomes more or less painful, urination more frequent than normal, and somewhat painful; defecation, though less often, may also be attended with discomfort. Menstruation may be deranged as to its frequency, duration, quantity, quality, or the presence of pain, directly resultant on the local lesion, or indirectly incident to the constitutional condition, especially the changed state of the blood.

It is merely a question of time for the local disease to make its impression on the general health. General symptoms arise with a degree of rapidity proportioned to the vigor of the constitution, its power of resistance, and as to whether the local disease has a general or local origin. Sooner or later, the patient begins to look pale, loses weight, is more easily fatigued, and lacks her accustomed energy. The appetite is poor, digestion is slow, feeble, and disturbed, expressed by a sense of heaviness after meals, acidity, flatulency, nausea, or vomiting. The bowels are usually constipated, the stools often being hard, dry, and insufficient.

Resultant on a depreciation of the general health from impaired nutrition and from a direct sympathy of the various portions of the body with the local disease, there are displayed various disturbances of circulation, respiration, and secretion, and also in the nervous system of motility and sensation. The latter rank most conspicuous among these. The patient becomes nervous, irritable, excitable, and hysterical.

It is in connection with the other inflammations of the uterus, especially of its body, that these reflex disorders will be more fully discussed, for it is with them that they are more commonly associated. Local and general symptoms do not always hold a direct relationship to the quantity of the local disease. In many cases they are out of all proportion to it.

Physical Signs.—1. *By Touch.*—In well-defined cases a digital

examination reveals the os externum and lower cervical canal more or less patulous, somewhat roughened or irregular in shape, especially in multiparæ and if there has been laceration of the cervical walls. The cervix may be slightly enlarged from infiltration, hyperplasia, and granular degeneration. The Nabothian glands as enlarged bodies may be felt.

Any great tenderness in uncomplicated cases is not marked, nor is the position of the uterus altered.

In the comparatively uncommon instances where the interior canal is solely affected no dilatation of the os may be present, and touch may elicit no evidence of the inflammation.

2. *By Speculum.*—The cervix well exposed by the speculum, the regions of the os externum and cervical canal are generally found filled with the characteristic albuminous discharge, so tenacious as to be difficult to remove. The cervix, once cleansed, displays the unmistakable traces of the epithelial erosion, the granular degeneration, the patulous os, the enlarged Nabothian follicles, and the cervical eversion. The speculum, carefully employed, enables one to detect the peculiar discharge pouring from the os, and clearly establishes the diagnosis in cases when touch has failed.

3. *By Sound.*—It is unnecessary to make use of the sound when the symptoms and signs as revealed by touch and the speculum point to a limitation of the catarrh to the cervical canal; but if employed not nearer than a few days to the menstrual period the os internum will be found undilated.

Diagnosis.—The diagnosis between chronic cervical endometritis and vaginitis is easy. Its differentiation from chronic endometritis of the upper uterine cavity is much more difficult, and will receive consideration in the description of that affection.

Complications.—Chronic cervical endometritis, being the most frequent uterine disease, may be associated with any other affection of the organ. The most common complications are—(*a*) vaginitis, resulting from the acridity of the cervical leucorrhœa; (*b*) cervical metritis; and (*c*) corporeal endometritis, resulting in general mucous inflammation of the uterus. Pruritus vulvæ is sometimes a very annoying complication.

Recent investigations and observations of Championnière, Leopold, Courty, and Mundé leave no doubt that a complication which, until of late, has almost escaped detection or proper recognition is occasionally present—viz. lymphadenitis and lymphangitis, diseases resulting from direct extension of the inflammation to the parametritic lymphatic vessels by absorption of infecting secretions from the cervix.

Duration.—The continuance may be indefinite, for it has no self-limitation. Once well established and left to itself without medical aid, it tends to progress and gradually bring into train various compli-

cations. Doubtless, mild cases in good constitutions may undergo spontaneous cure. These are certainly the exception and not the rule.

Prognosis.—This depends upon the condition of the general health, the severity and duration of the local disease, the extent of degenerate changes, and the amount, if any, of complications. In estimating the prognosis of any given case there is no more valuable factor than a determination of the state of the general health and whether the disease has had a constitutional or local origin. A seeming small amount of local disease in a broken-down constitution with a strumous taint is very much more difficult to eradicate than a larger amount of cervical change in good health and nutrition.

Appearances of the cervix to an inexperienced practitioner are very deceitful in a prognostic point of view. It is an observation borne out by the experience of most gynecologists that cases with granular degeneration of the infravaginal cervix and patulous os are more amenable to local treatment than those with no visible changes, but with copious tenacious secretion of the canal. Cases of the latter description are not only more difficult of access, but require, generally, more radical measures for relief. In the former topical applications addressed, in part, to the exterior of the cervix have a beneficial revulsive effect on the glandular disease of the interior.

Treatment is often tedious, and relapses from a slight renewal of causes liable to occur.

Treatment.—This is divided into constitutional and local. A consideration of the former is omitted at this place, and deferred until the subject of the management of both general and corporeal endometritis is reached. To that section the reader is referred.

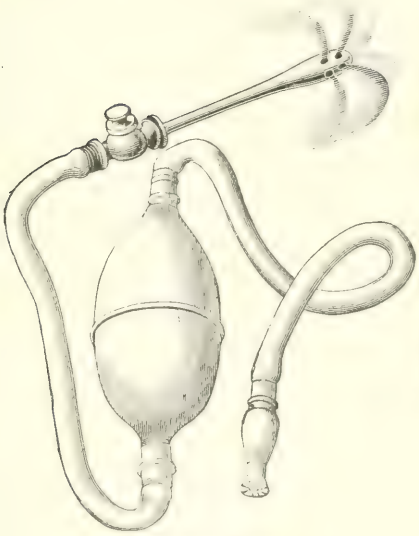
Local Treatment.—Cases requiring Local Treatment.—Reference has been made to the fact that chronic cervical endometritis does, in exceptional cases, undergo spontaneous cure. The cause, generally a local one, is removed, and Nature, aided perhaps by vaginal injections, is competent to restore the integrity of the parts. Again, by an improvement in the general health or a change in hygiene, the local disease is benefited. Not only are such cases exceptional, but they must be mild in character. Most women who have suffered for any considerable period of time will not only be greatly benefited by local treatment of a judicious nature, but absolutely require it. A seeming spontaneous cure is usually only a temporary improvement. Much controversy has taken place as to whether local treatment is required—its extent and kind. That it has been carried too far by some with limited views of the nature of the local lesions, and imperfect appreciation of their pathological import, must be admitted. But this is not an argument against this method of treatment; it merely indicates an abuse.

Vaginal Injections.—The use of injections of water, pure and medi-

cated, within the vagina and against the vaginal face of the uterus, is a matter of history from time almost immemorial. There is no agent or means which has been used in a more uncertain or unscientific manner, yet none, properly employed, capable of accomplishing in diseases of the female pelvic viscera greater good.

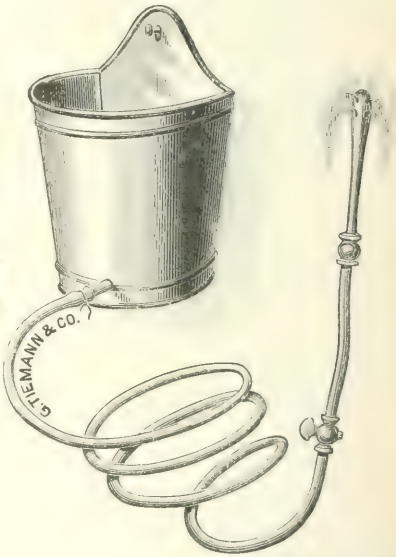
Selection of an Instrument.—The old-fashioned pewter or glass syringe has gone entirely into disuse, and is now mentioned only to be condemned. The Davidson syringe (Fig. 180), well made, air-tight, and in good working order, answers most purposes. Any quantity of fluid can be injected with it. Its chief objection consists in the fatigue produced by working the bulb for a long time—a matter of necessity where large quantities of water are used. Emmet has claimed that there is a special advantage obtained from an interrupted

FIG. 180.



Davidson Syringe.

FIG. 181.



Vaginal Irrigator.

current in all cases where the stimulant and absorbent effects of hot water are desired. The fountain syringe possesses many most excellent features. The bag holding the water should have a capacity of from two to four quarts. Any quantity of fluid may be injected without any effort on the part of the patient; the current is continuous and should be small and without force. The vaginal irrigator (Fig. 181) answers the same purpose as the above, and is admirably adapted for hospital use.

Whichever of these instruments is selected, special care should be taken to close the central distal (uterine) opening, to avoid the possibility of the accident of injection within the uterine cavity in cases

where the os is, from any cause, patulous. All tubes should be made of hard rubber, which will not corrode and is least affected by the temperature of the hot douche. The size should be sufficient to prevent breaking, and not too large for insertion. The shank of the tube should be straight, the extremity with small openings, olive-shaped, and the whole length five inches, sufficient to reach to the vaginal cul-de-sac posterior to the cervix.

Mode of Using.—The effects of vaginal injections are not fully obtained in the ordinary erect or sitting posture, where the abdominal and pelvic viscera are crowded down, the vagina shortened, and the cervix made to approach the vulvar orifice. The fluid more readily escapes, failing to reach, as it should, every portion of the vagina; thereby the special effect of the injection, whether detergent, absorbent, anodyne, or astringent, is lost. Moreover, the uterus, from a change in its axis and its separated cervical lips, is more apt to be distended with fluid. The dorsal recumbent position is worthy of the highest recommendation. With hips elevated and shoulders depressed, the abdominal viscera gravitate toward the diaphragm, the vagina lengthens, and its whole cavity is flooded with fluid, a certain portion of which remains around the cervix until the erect posture is assumed. This position, with the quantity of water required, demands the use of some special means as a receptacle for the fluid as it flows from the vulvar orifice. A round, flat bed-pan, of large capacity—or, better still, one with an outlet pipe and rubber tube attachment—or a rubber sheet suitably folded over the side of the bed, hanging in a tub below, upon which and over the edge of the bed the hips of the patient rest, with feet on two chairs, fulfils the necessary indications. Sometimes a contrivance which tightly fits to the vulva and prevents the escape of the fluid, except through an efferent tube, is very useful. By it the exterior organs are protected from the irritating effects of the hot douche, and the patient is kept dry, and a more thorough retention and distension of the vaginal canal are secured. Dr. Frank P. Foster has introduced such an instrument.

In addition to the dorsal decubitus, which is ordinarily resorted to in the manner described, patients may be placed in the knee-chest posture when it is thought best to further distend the vagina and ensure longer retention of medicated—especially disinfecting and astringent—hot-water injections. The position itself, through the influence of gravitation, powerfully aids in diminishing pelvic congestion. The proper administration of injections in these positions is best obtained by the attendance of an assistant.

Temperature.—Vaginal injections are used cold, cool, tepid, warm, or hot. If it is desirable to cleanse the infravaginal cervix and vaginal tube of all discharges, a warm injection, ranging from 85° to 100° F.,

is indicated. If, on the other hand, in addition to the above it is necessary to control pelvic circulation for the relief of venous congestion, the temperature must be hot, commencing at about 100° F. and daily, gradually, increasing it until it has reached 120° F. or more. The *primary* effect of water at this high temperature is to produce a dilatation of the blood-vessels, but of short duration. The secondary effect, which more quickly follows and is more permanent, provided the quantity is sufficient, is contraction. For a full understanding of the beneficial effects of hot-water injections the profession is indebted to Emmet.

Quantity.—A cleansing injection does not, generally, require more than a quart of fluid. For astringent purposes less is needed; for disinfection more will be advantageous. But when it is designed to obtain the thermic qualities, the quantity ought to be very large, ranging from half a gallon to several gallons at each sitting. The current should be projected steadily or with interruptions for twenty to thirty minutes.

Frequency.—Under almost any circumstances when injections are demanded to remove or control diseases of the cervix and vagina at least two are needed daily, and they may with decided advantage, in some cases, be administered oftener.

Indications.—(*a*) To cleanse with warm water the infravaginal cervix and vaginal canal of morbid secretions, thereby favoring the healing processes in the former and preventing secondary inflammatory action with its results in the latter; (*b*) to medicate these surfaces with emollients, anodynes, astringents, or antiseptics, according to special local lesions; (*c*) to contract with hot water the blood-vessels and diminish congestion of the cervix and its surroundings in the manner detailed. A permanent restoration of the tone and calibre of the blood-vessels is of paramount importance in the successful management of these cases; and this is a means to that end not to be neglected. As one of the immediate effects of such injections is to diminish local pain and soothe the irritable organs, thereby conducing to sleep, the best time for such administration is on retiring. At this time also opportunity is obtained through bodily posture to maintain a more permanent effect of capillary contraction.

The various astringents—plumbic acetate, zinc sulphate and chloride, tannin, alum—simply or in combination, are often efficacious where the vaginal face of the cervix is eroded, granular, and there are secondary vaginitis and pruritus. But milder agents, as pure castile soap, glycerin, sodium chloride, sodium biborate, boric acid, are ordinarily not only more conducive to comfort than astringents, but answer all the purposes of medicaments.

Contraindications.—Vaginal injections should not create any pain or uneasiness. Reference has been made to the possible accident of the

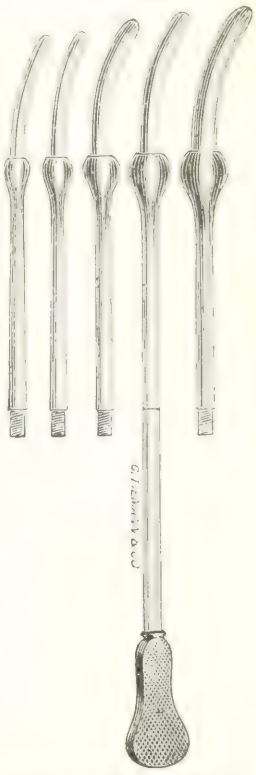
injected fluid reaching the uterine cavity because of some faulty construction or action of the instrument, carelessness in its use, or great patulousness of the cervical canal. This accident really frequently happens. Numerous instances of serious results, even deaths, have occurred and been reported. With proper care such need rarely take place. Occasionally there follows such a degree of pelvic discomfort after injections, although neither fluid nor air has entered the uterine cavity, that the practitioner may be obliged to recommend their discontinuance or modification. Probably these symptoms are explicable on the ground of special tenderness of the uterus or periuterine tissues, or that the injections are administered at first at too high a temperature. Generally, all that is required to meet such indications is to lower the temperature of the water, and then slowly increase it.

Topical Applications.—The propriety of direct topical applications of medicinal agents to the diseased cervix is the same as for any portion of the body, and to a great extent the same principles guide us. The medicaments are emollients, anodynes, astringents, alteratives, and caustics.

The following principles of local treatment should always be held in view: 1. Thorough cleanliness of the diseased surfaces; 2. Proper selection and adaptation of the medicinal application to the individual case or condition; 3. Thoroughness of application; 4. Proper intervals between applications; 5. Careful attention to the approach of an oncoming menstrual epoch and to that which has just closed.

The first is to be secured by a copious warm or hot vaginal injection preceding the introduction of the speculum. The cervix uteri, now being engaged by a speculum, is cleansed with small pieces of dry absorbent cotton, or by soft, clean, fresh sponge squeezed out of hot water, pure or medicated with sodium chloride, firmly seized with the dressing-forceps. The cervical canal requires particular attention. If it is much dilated the above means answer, but if narrow it is better managed with the cotton-wrapped probe. Thomas recommends a syringe for the purpose of removing the tenacious secretion which plugs the cervical canal. Whatever method is used, thoroughness is of the utmost importance, not only on the exterior of the cervix, but in the interior canal, for the medicament

FIG. 182.



Peaslee's Dilators (graduated).

is generally to be carried to within the latter. It is ever to be held in mind that the disease on the vaginal face of the cervix is rarely the whole affected surface. Usually, it is only pathognomonic of the glandular inflammation within, which, if untouched and uncontrolled, will surely cause a relapse of the erosion and granular degeneration, it matters not how effectually they may have been removed.

The disease itself so often opens up the cervical canal that dilatation by artificial means is comparatively rarely required. A successful issue, however, in cases of chronic catarrh of the cervical canal, where the vaginal face remains healthy and the os externum is not rendered patulous, makes dilatation necessary. We have for this purpose the metallic dilators fashioned after the patterns of Peaslee (Fig. 182), or Ellinger, or some of their modifications. Preference is given to those with expanding blades. The author's (Fig. 183), which he has used since 1874, is

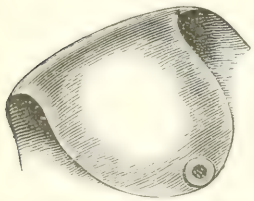
Fig. 183.

Palmer's Uterine Dilator.

simple in mechanism, easy of introduction, and if properly constructed secures an absolute parallelism of dilatation, from out to out, of three-fourths of an inch. A larger size also is now made when greater dilatation is desirable under other circumstances.

If *free* dilatation is sought in order to provide for a thorough application of some caustic agent, the choice is given to tents of sponge, tangle-weed, or tupelo. The superior advantages of the tupelo tent, introduced to the profession by Dr. G. E. Sussedorff, over the other materials are now generally recognized by gynecologists. It possesses the better qualities of both sponge and the tangle, without some of the disadvantages of either. By it the cervix can be effectually expanded, at the same time softened, and, being free from fetor and not tearing the mucous membrane, the dangers of septicæmic inflammation are reduced to a minimum.

Fig. 184.



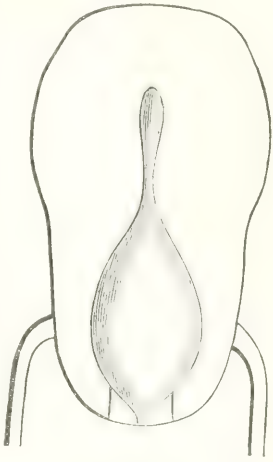
Conoid Cervix. Pinhole Os, the canal seat of catarrh.

Incisions of the mucous membrane with a knife before or in view of dilatation with tents, as recommended by some, are unnecessary and of doubtful propriety.

But there is a class of cases of chronic cervical catarrh, for the greater part confined to nulliparous single women or sterile married women, where thorough and permanent dilatation by

incisions or the forceps dilators is of imperative necessity. The catarrh is due to a narrow, constricted os, preventing a free exit of normal secretions of mucus and menstrual fluid. The abnormity is generally congenital, and undoubtedly most common at the os externum. The cervix is long, narrow, conoid; its canal, in consequence of pent-up fluids, dilated (Fig. 184). Acquired cases of stenosis are less frequent, and are resultant on the vicious use of caustics. A thick plug of mucus hanging from the os, and its free flow after the withdrawal of a sound, are proof of an accumulation and retention. The retention of even normal secretion leads to acridity and its results. Topical applications of medicine, the curette, etc. cannot possibly be of any lasting service. Dilatation by tents is insufficient, for its effects are only temporary. Bilateral or quadrilateral incisions (Fig. 185) as recommended by Fritsch and Mundé, made deep enough to open up the os as wide as the canal above, with precautions to maintain the same, are attended with the greatest benefit, and may be all-sufficient. Thorough divulsion of the cervical walls by a strong expanding dilator has also led to very good results.

FIG. 185.



Dilated Canal, from Obstruction at Os Externum: lines for incision (Mundé).

The *frequency* of applications depends largely upon the choice of the agent. The mistake is often made, and patients are in numerous instances given unnecessary pain, while at the same time the healing processes are delayed, by too frequent and uncalled-for applications. No agent should be applied or reapplied until the effect of a former one has passed away.

Another factor which should govern the frequency of topical applications is the special physical or mental susceptibility. Comparatively mild agents, sometimes without any discernible contraindication, unexpectedly set up irritation and pain. Hence the interval must be lengthened. Again, there are those who are profoundly disturbed in their nervous system by any local treatment. The practitioner may be forced to abandon, or at least to suspend for a while, such management.

It is always desirable that local examinations and treatment, even in married women, be reduced to a minimum consistent with recovery. In virgins only where constitutional measures, judiciously tried, have failed, and there is some special urgency required, are they justifiable.

It is almost unnecessary to remind the reader that the greatest caution is to be indulged in whenever a digital examination bespeaks any evidence of an old chronic perimetritic inflammation.

The physician should be watchful as to the time of the closing of the last and the approach of the oncoming menstrual epoch. The more potent the local agent in its effects, the farther removed it should be from the dates of menstruation. As a rule, local treatment, even of a mild character, ought to be suspended a few days prior to the approaching period, and not resumed again until as many days after its close. A disregard of these minor details tends to excite local pain, reflex disorders, and to derange the time and quantity of the menstrual flow.

The *choice* of agent is of paramount importance. The experience of the profession, after many years of trial, has now very fairly defined the indications and range of utility of local uterine medication. The time was, but fortunately has well passed, when gynecologists confined themselves almost wholly to the use of a single agent: nitrate of silver was universally used—of course to be abused.

So far as practicable, the inauguration of local treatment should be of a mild character, especially if the disease is not severe or its duration long. Emollients, anodynes, astringents, and alterative applications will cover the necessary indications for a large proportion of cases.

When the mucous membrane of the cervix looks highly hyperæmic the use of mild means to deplete from the distended vessels is always beneficial. These consist in the local abstraction of blood by superficial scarification of the region of the os and cervical canal or by puncturing the vaginal face of the cervix. Either may be followed by the application of a tampon of absorbent cotton saturated with pure anhydrous glycerin. If pain is a prominent feature of the local symptoms, the glycerin may be medicated with morphina sulphate (gr. $\frac{1}{4}$–$\frac{1}{2}$) or aqueous extract of opium (gr. j–ij) to each drachm. Belladonna may be chosen with the same object in view, and is thought by some (Trousseau and Ringer) to possess properties to diminish the secretion of the Nabothian follicles. The absorbing power of the vagina and cervix is not considerable—probably not more than one-fifth of that of the stomach—but it is materially increased by any superficial loss of tissue, as in abrasions and erosions.

The tamponade with glycerin may be reapplied every second to third day, each being permitted to remain some twenty-four hours. The influence of pure glycerin thus applied to the congested cervix, through its affinity for the watery elements of the blood—a power most fully demonstrated in cases where the chronic inflammation has involved the fibrous tissue as well as the mucous membrane—is remarkable.

If scarification or puncturing is repeated, it should be at intervals of three to five days. Not all cases of chronic cervical endometritis require direct depletion. The glycerin applications in some form have a wider range of usefulness, but the local improvement is very frequently indeed facilitated by these preliminary abstractions of blood. The addition of boric acid to the glycerin—the boro-glyceride (50 per cent. solution)—is a valuable one, especially if in addition to the hyperæmia and catarrh there is superficial ulceration. Not only is the glycerin of this combination rendered more dense and anhydrous by heat, but the boric acid is emollient and antiseptic.

Among the various astringents from which the selection may be made, none is superior to tannic acid. Its best vehicle is glycerin —glycerite of tannin (tannin ʒj–ij to glycerin ℥j). A tampon of cotton of suitable size is saturated with one to two drachms of this solution, and packed thoroughly against the cervix every two to three days. Styptic colloid and concentrated ext. pinus Canadensis are other useful agents of the astringent class.

Fluid hydrastis, though not an astringent, either pure or diluted with boro-glyceride, is an excellent application, made with cotton, for catarrhal states of the cervix.

The indications for astringents are hypersecretion, due to hyperæmia and relaxation of the blood-vessels and glands. By their use not only are the secretions more or less checked, but erosions and granular degeneration are made to disappear.

Such applications as above mentioned are made only to the vaginal face of the cervix. Here they produce their best effect; indirectly they influence the morbid conditions of the canal above. But one must not be deluded with the idea that such treatment will often suffice to complete a cure. A permanently good result, if the disease is of long standing and severe, is seldom secured unless the local treatment be extended within the cervical canal. The agents which may be introduced within the cervical canal are—astringents, as tannin, zinc chloride; alteratives, as iodine and its combinations; caustics, as silver nitrate, carbolic acid, chromic acid, nitric acid, and the actual cautery. There are many others, but these embrace those which the experience of the author has found most useful.

For solids, the method by suppositories, gelatin-coated pencils, and crayons; for fluids, that by the cotton-wrapped probe, are used. Tannin (grs. iij–v), zinc sulphate (grs. ij–iij), can be incorporated in an appropriately sized suppository made of cocoa-butter or in a gelatin-coated pencil. Either is inserted into the cervical canal every third day, held in position by a packing of cotton around the cervix, and allowed to remain until well melted.

A certain amount of skill, acquired only by practice, is necessary

to prepare the cotton-wrapped applicator. The method is as follows: A flexible hard-rubber probe (Fig. 186), nine inches long, with a bulbous extremity and firm handle, one face of which is roughened, is to be preferred to the silver instrument, because more flexible and not affected by the chemical action of any agent. A thin film of prepared cotton is wrapped around the distal extremity for three-fourths of an inch, care being taken that it is not too thick to pass readily within the canal or so loose that it may slide off. The parts now having been thoroughly cleansed of secretions and dried with absorbent cotton, the cotton-wrapped applicator is dipped into the selected fluid and pressed against the walls of the vial containing it to rid the wrapping of any superfluous material. Then it is gently introduced into the cervical canal to the os internum, and allowed to remain a few seconds before withdrawal. Any excess of fluid which possibly may be squeezed from the applicator and run down around the os externum should now be removed with sponge or cotton. There are those who prefer to make use of applications of this kind without the speculum, but accuracy, as well as neatness, demands the aid of this instrument.

Fig. 186.

Hard-rubber Probe Applicator.

Iodine in alcoholic solution is one of the most efficacious remedies we possess. Unless used too strong or too often, it is not irritant, but stimulant, alterative, and antiseptic, and is not altered by the secretions of the cervix as most medicaments are. The officinal tincture is usually too weak. Churchill's tincture (iodine, grs. lxxv, potassic iodide, ʒjss, to alcohol ℥j), very much stronger, is often to be preferred. A good tincture is one from ♈ijss–ʒj to ℥j, with a small quantity of potassic iodide to facilitate solution. This can be applied to the exterior of the cervix and the canal once per week and covers the indications for a large number of cases. Iodo-tannin (tannin dissolved to saturation in the foregoing tincture of iodine) answers a similar purpose, and may at times be beneficially substituted.

Carbolic acid (liquefied crystals), used at the same intervals, is less caustic than silver nitrate and possesses none of its disadvantages. Locally, it is anæsthetic. Either in this form or as iodized phenol (2 parts of iodine with 8 parts of carbolic acid) it is a favorite remedy with many gynecologists.

Nitrate of silver, once so universally used for all cases and conditions, has now fallen into undeserved disuse. Applied to the cervix, its first effect is to produce more or less pain, which usually passes off

within a few hours, followed on the second and third days by more or less hemorrhage from the cauterized surface, with exfoliation of a superficial eschar. It thereby acts as a stimulant of the processes of granulation and cicatrization. Sooner or later, according to the amount and frequency of the cauterizations, excessive cicatrization at its seat and condensation of the surrounding fibrous tissue follow. The cervix thus becomes harder, denser, and the region of the os externum contracted—a stenosis, causing sterility and menstrual obstruction. It is also well known that cicatricial tissue, by inclusion within it of nerve-filaments, may give rise to persistent local and general reflex neuralgias. The pain and hemorrhage, although possibly severe, are not the most serious objections to the use of the nitrate, but the foregoing secondary morbid conditions produce effects worse than the original disease. There was a time, not many years since, when acquired stenosis of the os and cervical canal from the vicious use of caustics, the nitrate of silver in particular, necessitating dilatation by incision, was quite common. Yet the very ill effects which have led to its almost complete abandonment have also taught us its superior advantages under proper indications. A cervix, which is soft, flabby, eroded, and granular, its canal patulous, pouring forth profuse muco-purulent secretion—a condition found, for the most part, in multiparæ—is greatly benefited by the application of the crayon of silver nitrate (5 per cent. chloride) to the whole diseased surface, at first about once per week, afterward at longer intervals. The secretions diminish, the erosion heals, the canal contracts, and the cervix—although perhaps slightly lacerated, not so much as to require tracheloplasty—resumes its normal shape. The intervals need no local interference save the use of the vaginal douche. The number of applications is determined by the progress in each individual case, the utmost caution being observed to discontinue their use before the seeming necessary contraction has been reached, for this effect is continued far beyond the last one. Further treatment, if necessary, may be continued with iodine, the glycerol of tannin, or boro-glyceride.

A flexible silver probe of curve suitable to pass through the cervical canal, dipped into the fused nitrate, after the manner of Sir Benjamin Brodie, may be substituted for the crayon.

Solutions of the nitrate (grs. xx–lx to ℥j) are less injurious than the solid, in mild cases equally efficacious. The weak solutions are adapted to more irritable forms of erosion, and the stronger to the more sluggish. Solutions are to be preferred when granulations are very vascular.

Solutions of the chloride of zinc (℈j–℈iij ad ℥j) will be found quite efficacious at times.

Nitric acid, a more potent caustic than the silver nitrate, though not

more painful, and less apt to be followed by hemorrhage, is adapted to conditions similar to the above and the more rebellious forms of catarrh of the Nabothian follicles. After its use with the cotton-wrapped applicator the vagina needs to be protected by a tampon of cotton wet with glycerin or oil placed against the cervix. The eschar formed separates in from a week to ten days, and leaves a granulating surface. Nitric acid ought not to be reapplied at intervals shorter than one month, the choice of time being one week after the close of menstruation.

Acid nitrate of mercury has nothing to recommend it above nitric acid, and its use is open to the grave objection of the possibility of inducing salivation through its general absorption.

Chromic acid, deliquesced or with an equal part of water, is an efficient caustic, comparatively painless, safe, and not liable to induce secondary contraction and cicatrization. It too, in full strength, need not be applied more often than once a month, although weaker solutions (℥j ad ℥j) can be used once a week.

All these more active caustics should generally be reserved for the more severe forms of the disease which after long standing have resisted a milder course of treatment. The tendency of the gynecological practice of to-day is to restrict their use to the smaller number. The aim of the physician should be to make the local management as mild and as painless as practicable. As the disease is one depending upon or resulting in debility and nervous derangement, the practitioner will avoid, if possible, irritating agents and painful measures, which have a depressing effect on the system at large. Caustics have heretofore been used too extensively, and there has been a lack of judgment in the selection of agents of this kind which would not have been tolerated in local treatment elsewhere. The best results are frequently obtained by an occasional change in the choice of application. As no one agent answers all cases, so no one can be depended upon during the whole period of management. The local condition left after cauterization may be much improved by astringents or stimulating alteratives. Astringents in time lose their effect, and should be supplanted by emollients, etc.

Many of these topical applications referred to do not require to be followed by any special rest on the part of the patient. With perfect safety they may be made, if convenient, at the physician's office. But all caustics of the more active kind ought to be applied not only at the patient's residence, where she can take the necessary rest, but caution demands that she maintain the same for several days in addition, until all irritating effects have passed away.

Chronic cervical endometritis engrafted on a laceration of the cervix may be bettered, but cannot be permanently relieved, by topical medication, if the rent is bilateral or multiple, and to within the fibrous

tissue, and there is eversion. Progress in the improvement will continue to a certain point, then cease, and as surely relapse upon suspension of the treatment. Tracheloplasty is the one necessary step.

Allusion has been made to the utility and necessity of such caustics as nitric acid and chromic acid to the cervical canal in old, rebellious catarrhs dependent on excessive and persistent secretion of the Nabothian follicles. Not only do the mild caustics utterly fail to effect any favorable change, but even these potential caustics frequently prove inadequate. Under these circumstances the plan recommended by Sims should be practised. After dilatation of the canal with a tent, the follicles and granulations are thoroughly scraped down to healthy tissue with the sharp steel curette, after which the actual cautery or Paquelin's thermo-cautery, a little above black heat, is run over the whole surface. A second application may be needed. The potential caustics, after curetting, would answer much the same purpose as the actual cautery. Dr. Isaac E. Taylor, from a considerable experience, reports favorably concerning this practice. Thomas gives the use of the sharp curette in these cases his earnest indorsement. Although the risk is small, the operation ought to be followed by necessary rest. The greatest objection that can be urged against it is the possibility of subsequent constriction of the canal. But so effectual are these procedures that cases which hitherto have been considered incurable may be made perfectly amenable to treatment. Not only will good follow the excision by the knife or scissors of exuberant granulations from around the os and cervical canal, but it is a procedure calculated to abridge, to great degree, the course of other local treatment. Excessive enlargement of the cervical glands—mucous polypi—is to be treated by abscission, and in certain cases exsection of hypertrophied and projecting tissue may be similarly dealt with.

May local treatment to the diseased cervix and canal be carried on during pregnancy? With proper precautions and due care we answer the question in the affirmative. Most of the accidents in the induction of abortion by local interference have arisen from a neglect to investigate and determine the condition of the body of the uterus, and ascertain whether it may have been gravid. Pregnancy aggravates chronic cervical endometritis, in that it increases the catarrh, the granular degeneration, the secondary vaginitis, and pruritus. By the gentle use of warm vaginal injections of a uniform temperature, and by the topical use of astringents and emollients—in rarer cases the nitrate of silver in solution—not only may the patient be made more comfortable through an improvement in the local disease and the arrest of reflex disorders, as nausea and vomiting, but parturition itself be made easier.

Bibliography.

Battey, Robert: *Am. Gynecolog. Transac.*, vol iv. p. 55 *et seq.*
Bennet, J. H.: *Inflammations of the Uterus*, 1861.
Championnière, Courty, and Leopold: *Am. Journ. Obstet.*, vol. xvi. p. 1009 *et seq.*; *Non-Puerperal Pelvic Lymphadenitis and Lymphangitis*, Paul F. Mundé.
Emmet, T. A.: *Principles and Practice of Gynecology*, 1884.
Meigs, Charles D.: *Diseases of the Neck of the Uterus*, 1854.
Mundé, Paul F.: *Minor Surgical Gynecology*, 1885.
Paget, Sir James: *Clinical Lectures and Essays*, 1875.
Ringer, Sidney: *Handbook of Therapeutics*, 1880.
Sims, J. Marion: *Am. Gynecolog. Transac.*, vol. iv. pp. 63, 64.
Sussendorf, G. E.: *American Journal Obstetrics*, vol. vii. p. 473.
Taylor, Isaac E.: *Am. Gynecolog. Transac.*, vol. iv. pp. 64, 65.
Thomas, T. Gaillard: *Treatise on the Diseases of Women*, 1880.
Trousseau et Pidoux: *Traité de Thérap.*
West, Charles: *Pathological Importance of Ulceration of the Os Uteri*, 1854.

CHRONIC GENERAL ENDOMETRITIS AND CHRONIC CORPOREAL ENDOMETRITIS.

Definitions and Synonyms. — Chronic corporeal endometritis signifies a chronic inflammation of the mucous lining of the uterus above the os internum. General endometritis signifies that the cavity of the cervix is also implicated.

Corporeal endometritis and general endometritis, localized for the greater degree in the corporeal cavity, are recognized by the names of chronic uterine catarrh, leucorrhœa or blenorrhœa, internal metritis, fundal endometritis, etc.

Frequency.—Here there has been the greatest conflict of authority. The utmost extremes of opinion have been, and are even now, entertained. With the views of Bennet the profession is well acquainted. With him the neck of the uterus was the favorite, the almost exclusive, seat of chronic inflammation. Tyler Smith denied the existence of chronic corporeal endometritis. On the other hand, Aran and West contended that the mucous membrane of the uterine body is more frequently the seat of disease than that of the neck. Hennig concurs in this view, and also believes in the frequent existence of Fallopian catarrh. Tilt, an authority equally good with Bennet, his associate at one time in practice, radically dissents from the opinions of that distinguished gynecological pioneer. Klob, whose expressions on such matters are entitled to the greatest respect, describes the disease as of frequent occurrence.

Most modern authorities—Bernutz, Courty, C. Braun, Scanzoni, Schroeder, Fritsch, Atthill, Barnes, Routh, Playfair, Simpson, Hart and Barbour, Edis, Thomas, Goodell, and Byford—now recognize the corporeal form of chronic endometritis, either as a distinct entity or in the form of general endometritis. There is, however, a great variety of opinions among these as to the relative frequency of the two diseases.

The author takes the position that both clinical and post-mortem evidence prove that corporeal endometritis may exist as a distinct and well-defined affection, like that kindred one of the cervical canal. If careful search is made in bodies that have died from other diseases, acute and chronic, it is believed that unmistakable evidences will be found of its existence. In our present state of knowledge of endometrial diseases it is safe to assume—

1st. Inflammation of the cervical mucous membrane is by far the most frequent of all the chronic forms of the disease.

2d. General endometritis stands second in the order of frequency, and is largely confined to the multiparæ.

3d. Corporeal endometritis, the least frequent, is nevertheless a much more common disease than has usually been accepted. Generally, it is confined to the nulliparæ. Its recognition explains many cases of rebellious leucorrhœa, menorrhagia, dysmenorrhœa, and sterility.

There seems no good reason for recognizing fundal endometritis as a distinct form of the affection. Its symptoms are not characteristic, and it probably never exists independently of a similer condition of the remaining corporeal and, it may be, the Fallopian mucous membrane.

Pathological Anatomy.—Like chronic inflammation of the cervical mucous membrane, corporeal endometritis is essentially a glandular disease. In recent cases post-mortem appearances show the mucous membrane hyperæmic, swollen, soft, and succulent. Pigment-streaks, brownish or blackish in color, resulting from blood-extravasations, are found. At first the tissues are quite red, while later they become grayish. The surfaces are either smooth, papillary, or uneven, especially on the fundal and posterior walls, and covered with secretions. The gland-openings are quite visible, the cavity dilated. The hypersecretion is clear, in consistency thin and in reaction alkaline. It contains the chlorides. It may be brownish and bloody, and after longer duration muco-purulent or purulent. Granulations small in size or like villous or polypous masses are seen covering the surfaces.

In old cases still more important anatomical changes are noticeable. The mucous membrane is eroded—a desquamation and destruction of the peculiar ciliated epithelium. Its presence is replaced by polymorphous cells with a pavement-like epithelium. The whole membrane, the utricular glands included, now becomes smooth, thin, and atrophied. A layer of connective tissue lines the cavity, covered only, perhaps, by polymorphous cells, or the membrane within which are minute cysts of degenerated glands may be transformed into a callous structure of varying thickness. The glands, however, before undergoing general atrophy, quite commonly take on cystic degeneration from a constriction or localized atrophy of their orifices, resulting in retention of their contents. Their appearance is that of rounded, hemispherical projec-

tions or pedunculated tumors, varying in size from a pinhead to a large pea, elastic to touch and with transparent contents. These glands may likewise be greatly hypertrophied—cystic or glandular polypi. Associated with the above conditions are the so-called vegetations, granulations, or fungosities. They resemble somewhat papillary epithelioma, and may degenerate into that condition. Also, there may be detected pit-like depressions and elevations formed by a rupture of or falling out of the glands. Their presence may lead to the formation of adhesions and the subsequent development of hydrometra and hæmatometra. Chronic metritis is a frequent complication.

General endometritis presents more or less of the foregoing pathological lesions, in conjunction with those of the cervical canal already described.

Etiology.—The causes are of two kinds—predisposing and exciting.

A. *Predisposing Causes.*—Among these prominently rank the various diatheses and cachexiæ—scrofula, tuberculosis, syphilis, anæmia, leukæmia, hæmophilia, malaria, rheumatism, gout, herpes, etc. The strumous and phthisical diatheses are very common. Syphilis acts as a cause by enfeebling the general health and impoverishing the blood.

Corporeal endometritis occurs at all ages, from the beginning of menstrual life to old age, and that, too, without any special local exciting cause. Therefore, the best evidence of the operation of the predisposing causes is afforded. So important a structure as that of the interior of the uterus, subject periodically to changes of the highest physiological hyperæmia, desquamation, and repair, is, above most others, especially liable to receive the stamp of certain general morbid states. Causes acting locally may be wholly inadequate to produce the effect without inherent or acquired predispositions. The local disease is at times the only expression of the latent but existing constitutional taint.

B. *Exciting Causes.*—Chronic endometritis is a very frequent sequela of acute endometritis occurring from whatever cause, either in the parturient or non-gravid uterus. After parturition, as a result of the non-recognition of the disease, want of proper or sufficient attention thereto, some vice of constitution, or too early resumption of the erect posture, a very large proportion of the cases of acute endometritis are imperfectly recovered from and the chronic affection becomes established.

Endometritis originating within the area of the placental site must be recognized. The return of this special area after parturition or abortion to its original size and state is often delayed and imperfect. Retention of hypertrophied decidua and young placental masses at or about the third month of utero-gestation, with, it may be, partial

organization of the same, leaves the interior of the uterus as a rough, raw-like surface, secreting muco-pus, and the source of a persistent sanguineous discharge. The surrounding parenchyma is thickened and vascular—imperfect involution. Chronic endometritis supervenes.

Bennet himself expresses the possibility of corporeal endometritis as the result of the lengthened existence of inflammatory disease of the cervix. Chronic vaginitis may eventuate in chronic endometritis. Chronic pelvic peritonitis and salpingitis may have a similar but downward course. But specific inflammation, starting in the vagina, is infinitely a more frequent cause of chronic endometritis. Noeggerath has drawn the attention of the profession to the frequency, insidiousness, and serious consequences of what he terms "latent gonorrhœa in the female." Although some of these views—seemingly extreme—as to the prevalence of chronic gonorrhœa in women, taken from husbands who previously—it may be many years—have had the disease, are not substantiated by others, nevertheless Dr. Noeggerath has invited a professional interest in a matter of the deepest concern, involving the health of women and their fertility. This much, at least, seems conclusive: Chronic gonorrhœa in the male, supposed to have been cured, often is not so. Its insidious lurking in the male is a fruitful source of chronic uterine catarrh in women previously healthy. This catarrh resides in the upper uterine cavity, is very stubborn, often incurable, and is the cause of permanent sterility.

Another cause of corporeal endometritis is enforced sterility. Nature seems to have designed that the internal genitalia, through the influences of pregnancy and lactation, should have stated periods of change and rest. The ever-repeating periodical influxes of blood to these organs, month after month for many years of married life, together with the turgescence of the vessels inseparably incident to coitus, aggravated by such means as are employed to prevent impregnation and thwart gestation, are sooner or later inevitably followed by their evil consequences.

An important influence which produces this affection is obstruction to the escape of the natural secretions, menstrual and otherwise. These obstructions are formed (*a*) at the os externum from congenital malformations of the cervix—the elongated and conoid cervix—and acquired strictures, usually following the vicious use of certain caustics; (*b*) at the os internum from flexion. The cavity above the obstruction becomes dilated by distension from accumulation. The uterus is provoked to painful contractions to empty itself. The retained secretions decompose and are transformed into irritating matters. Thus, in consequence of distension, septic accumulation, and abnormal contractions, the mucous membrane above the point of obstruction becomes inflamed. Finally, chronic uterine catarrh is provoked, aggravated, and perpetuated by lacerations of the cervix, chronic congestions,

displacements of the whole organ. The recognition of these causes, when existing, may be the keynote to the successful management of the disease.

Symptomatology.—*General Symptoms.*—There is the greatest diversity of symptoms in different cases. The disease may continue for several years with prominent local symptoms, yet the general health seemingly remains good. Again, the greatest general disturbance in kind and degree may be present. The tendency of the affection is to gradually undermine the general health—for the patient to lose weight and strength, to become anæmic and annoyed with sympathetic disorders of digestion, circulation, and innervation. All the reflex symptoms are more decidedly manifested than in cervical disease. Chief among these are those of the nervous system—cerebral, spinal, and ganglionic.

Cephalalgia, especially on the crown of the head, of a burning character, is one of the commonest of symptoms. Attacks of migraine at or near each catamenial epoch are frequent. Then there is hysteria in its protean forms, hystero-epilepsy, catalepsy, melancholia, insanity, etc. In rarer instances there are paralyses, amaurosis, dyspnœa, palpitation, cough, aphonia, and the various vaso-motor neuroses. Certain neuralgias, facial, spinal, intercostal, etc., are very often experienced. Disorders of the skin and its appendages, pigmentations on the forehead and face like those seen in pregnant women, hyperæsthesia or anæsthesia, loss of hair or change in its color, are also at times present.

The digestive system seldom escapes unaffected. The appetite is impaired and capricious. There may be nausea and vomiting, especially at the approach of menstruation; also gastralgia, flatulency, diarrhœa, or constipation. The urine may be turbid, loaded with urates or phosphates; more often there is an abundance of clear, pale, limpid urine, deficient in salts.

Now and then the general symptoms simulate very closely those of pregnancy. Thus there are nausea and vomiting, enlargement of the abdomen from flatulency, pain and tenderness in, and enlargement of, the mammary glands. If, in addition, there should be menstrual irregularity of the form of amenorrhœa and the uterus be enlarged, an error in diagnosis is easily committed. Tilt has regarded the presence of the signs of pregnancy in young women without menstrual suspension as *primâ facie* evidence of internal metritis.

Various explanations have been offered for the condition of meteorism so often and prominently exhibited. Most probably it is a reflex irritation leading to paresis of the nerves governing tonus of the intestinal muscle, and consequent accumulation of gas.

Local Symptoms.—The first, most important, and most constant of all the local symptoms is leucorrhœa. Arising solely from the corporeal cavity, it is glairy like starch-water, or is purulent and very com-

monly commingled with blood. It is never so thick, viscid, or tenacious as is the product of the cervical glands.

Bennet regarded the rusty-colored leucorrhœa—an admixture of blood and mucus—"a characteristic of internal metritis, as the rusty-colored expectoration is of pneumonia." This kind of discharge mostly follows the menstrual flow, but may continue through the month, constituting metrorrhagia. In old and rebellious cases it may be purely purulent. The quantity is always increased after menstruation. In anæmic subjects the menstrual flow may consist almost entirely of mucus and pus. While corporeal leucorrhœa is generally less abundant than cervical, it is far more irritating in its properties. It often possesses such acridity that the vaginal and vulvar surfaces look red and eroded—secondary vaginitis and vulvitis. Thus there is aggravating pruritus. Such effects are by no means in proportion to the amount of the catarrhal discharge, for the smallest quantity may be the source of the greatest annoyance. There is but little doubt that such leucorrhœa is capable of producing urethritis in the male.

Notwithstanding the uterus at the close of menstruation is disposed to take on senile involution or atrophy, terminating those periodical congestions which tend to perpetuate any inflammatory action with its catarrh, the morbid processes may remain indefinitely from the direct force of the disease or some impediment to the pelvic venous circulation. There may be apparent return of the menstrual flux many months after its function has been supposed to cease. The cavity of the uterus continues to throw off a creamy or watery discharge of special acridity. This is chronic senile catarrh. Barnes states that in a considerable number of such cases he has found more or less complete closure of the cervical canal in some of its parts, the walls having grown together by a process compounded of inflammation and atrophy. The secretions continuing, accumulate, and retention ensues.

Pain is a very uncertain symptom. Its seat may be the back, the hip, or the uterine, or ovarian region. The extent of pain depends more upon the amount and kind of complication, as chronic metritis proper, displacements of the uterus, perimetritic inflammation, than upon the endometritis itself.

After leucorrhœa, the next most constant symptoms refer to the aberrations of menstruation. Menorrhagia, as to quantity, time, and duration, stands first in order. The flow appears at shortened intervals, is too free, or prolonged. Menorrhagia may be merged into metrorrhagia. Another feature of this form of menstrual disorder is an interruption in the flow: thus, after continuing for a few days, it stops for a day or so, to return again. Profuse and dangerous hemorrhages sometimes occur from a fungoid condition of the endometrium.

The opposite menstrual state, amenorrhœa, is observable usually

only after a long duration of the disease, when the mucous membrane has become smooth, indurated, and atrophied.

Dysmenorrhœa in some variety—the congestive, from a hyperæmic, swollen endometrium; the obstructive, from associated stenosis or flexion; the membranous, from an exfoliation of the entire lining—occurs. By most authorities this shedding of the membrane in dysmenorrhœa is regarded as an evidence of chronic corporeal endometritis.

Sterility is present in the majority of cases of endometritis of the corporeal cavity, whether primary or secondary to stenosis or flexion, for the following reasons: 1. The discharges are inimical to the vitality of the spermatozoa. 2. There is frequently some obstruction to their entrance within the cavity, because of stenosis or the quantity of morbid secretions. 3. Should fecundation take place there is an inability to retention and fixation of the fertilized product, because of the unhealthy endometrium. It is easy to understand how a smooth surface or one covered with unhealthy secretions, a dilated cavity, and a patulous internal os may afford a poor resting-place for the ovum. Or, instead of escaping altogether, the ovum is stopped only at the inner os. Concerning this point Klob has well remarked as to the predisposition to the occurrence of placenta prævia in females who have suffered for a long time from blenorrhœa (uterine catarrh). Fertility is possible, but not probable. Thus every function of the uterus is deranged in this disease.

Physical Signs.—Patulousness of the os internum from a relaxation of the sphincter at the isthmus, increased length and capacity of the corporeal cavity, tenderness of the corpus uteri to touch and bimanual examination, without at the same time any special enlargement, great sensitiveness at the regions of the os internum and fundus on the application of the sound, with a tendency to bleeding,—these are the most reliable signs.

Diagnosis.—This is determined by a combination of the symptoms and signs. Localized pain and tenderness, the presence of the characteristic leucorrhœa pouring forth from the uterus, menstrual disorders and sterility, associated with a dilated internal os, enlarged corporeal cavity, with special tenderness therein on sounding, are the evidences of the disease. Not all of these are noticeable in every case. In many certain symptoms or signs may be wanting, and in a few there is nothing save the leucorrhœa to excite any suspicion of the nature and seat of the trouble.

The differentiation between cervical and corporeal endometritis is easily determined by the presence in the former of the characteristic cervical discharge, and certain special local signs in the cervix as revealed by touch and the speculum, and their absence in the latter.

General endometritis combines the symptoms and signs of both.

One reason why inflammation of the cavity of the uterine body has so often passed unrecognized is that, being complicated with cervical disease in the form of general endometritis, the practitioner has satisfied himself with what he sees. Not perhaps until he has failed to relieve his patient, although the cervix by local treatment presents an improved appearance, will he be disposed to explore farther.

Complications.—The most common complications are vaginitis, pruritus, metritis, uterine displacements, and flexions. Most utero-ovarian diseases can be traced to the inflammations of the endometrium.

Prognosis.—Prognosis depends upon the extent, duration, and complications of the disease, as well as the state of the general health. A long-standing purulent catarrh with metritic complications and bad general health presents a very unfavorable prognosis. But there are many cases, less severe, which are quite amenable to treatment. General endometritis yields more readily than pure corporeal. In the multiparæ, *cæteris paribus*, prognosis is more favorable than in the nulliparæ. Cases of gonorrhœal origin are especially stubborn.

Some authorities are very dubious as to the curability of this disease. Scanzoni is often quoted as saying that he cannot remember a single case cured. Although this statement conveys a more gloomy idea in reference to the prognosis than the actual facts will admit of, yet it must be acknowledged that chronic corporeal endometritis is one of the most intractable affections we are called upon to treat, and, uncontrolled by treatment, it has an indefinite continuance, manifesting no disposition to abate, until at the menopause, with the suspension of the menstrual function, atrophy of the uterus ensues. Nature does not always bring about relief even at this time, for senile catarrh may remain for many years longer to annoy the patient.

Local Treatment.—Having diagnosticated intracorporeal inflammation, at first view it would seem wise and urgent that local treatment be instituted here in the same manner that is found so beneficial for the similar disease of the cervical canal. Further reflection on the function and sensibility of the inner uterus, and especially a careful review of recorded experiences, lead one to undertake such treatment not only with some hesitation, but certainly with much caution. Bennet has contended that the cavity of the uterus proper bears surgical interference less than any other part of the organ. Experience shows that this view is correct. Surprise must therefore be expressed at the doctrine advanced by Miller, that treatment to this region could be maintained with as much familiarity and as little apprehension as to the uterine neck.

As to the necessity of intra-uterine treatment, few gynecologists doubt. It has the indorsement of most modern practitioners in this field of labor. The chief questions are: When? In what cases? How? and, What are the agents to be employed?

Bennet has said: "Internal metritis is generally subdued by means adapted to cure the inflammation of the cervical canal which accompanies it." There is a grade of truth in this statement. There can be no doubt that corporeal endometritis of limited duration, mild in character, coexisting with cervical, may be subdued by attention addressed exclusively to the latter. It does not seem reasonable to suppose, however, that when the opposite conditions exist any material or lasting benefit can be obtained in this manner.

The testimony of so acute, careful, and experienced an observer as Thomas is worthy of note. He says: "Observation and experience have so changed my own practice that I find myself very rarely, at present, resorting to applications above the internal os." Their occasional necessity, however, he does not deny. Emmet says he has abandoned them since 1879. On the other hand, another prominent and skilful observer, Goodell, always carries his application to the fundus whenever the internal os permits it to pass. By so doing, he says, he has obtained better results, without more hazard, than when limiting the same to the cervical canal.

Selection of Cases.—Practically, in management three kinds of cases may be recognized:

1st. Cases of chronic corporeal endometritis, dependent upon and perpetuated by certain morbid constitutional conditions and diatheses. Here local treatment accomplishes little at best—as a rule, signally fails; in fine, in many instances may be entirely dispensed with.

2d. Cases in which the corporeal coexists with the cervical disease, both arising from a common cause, as is usual after abortions or parturition at term. Such cases are limited, for the most part, to the multiparous organ, but almost always show a greater intensity in the cervical region. Local medication, addressed solely to the cervix, will often suffice, the disease of the corporeal cavity being arrested through the derivative and depleting influences of the agents there applied.

3d. A class of cases, considerably less frequent than the last mentioned, in which the disease is not the outcropping of a diathesis, and is localized to a point above the internal os, or if coexistent with cervical disease the latter is secondary. Here cases of old, well-pronounced menorrhagia, metrorrhagia, dysmenorrhœa, and metrorrhœa are not influenced by cervical treatment. The indications are clear, and the necessity for the execution is manifestly imperative, unless some special contraindication presents itself, to direct the local treatment to the seat of the disease.

From the foregoing classification the inference is that the number of cases absolutely requiring intra-uterine medication is relatively small.

Under all circumstances it is important that the underlying general and local condition be diagnosticated. Sometimes a comparatively

small local lesion or abnormity of the cervix, which is at the bottom of the whole difficulty, must first be remedied.

The Method.—There are, in general, two methods for the introduction of medicinal agents within the uterus—ingestion and injection.

A. Ingestion.—(*a*) *By the Applicator.*—Preference is to be given to the instrument of hard rubber or virgin silver (Fig. 187), made smooth, slim, flexible, and with an olive-shaped extremity. Absorbent cotton is carefully wrapped around the extremity in quantity sufficient to absorb an adequate amount of the selected fluid, and yet not so much as to interfere with its passage through the uterine canal.

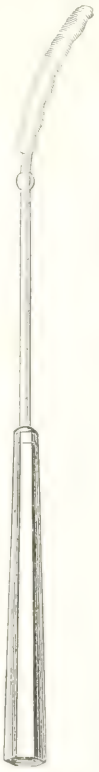
To secure thoroughness and efficiency of application the following preliminary steps are needed, a disregard of which is the chief source of failure in intra-uterine medication:

1st. Free exposure of the cervix by means of the speculum, choice being given to Sims's, with the patient in the left-lateral semi-prone position, the cervix being steadied with the self-retaining tenaculum.

2d. A certain amount of dilatation of the cervical canal, including the os internum. The disease usually does this; if not, it should be secured by a tent (tupelo) or expanding forceps. The latter are to be used gently, and never expanded to the full width of the blades. Dilatation through disease or artificially is not only necessary to facilitate the introduction of the curved cotton-wrapped applicator, but also to prevent the medicating fluid being squeezed from the cotton by the contracting cervix.

3d. The diseased endometrium, which is to receive the impress of the medicament, should, so far as possible, be cleansed from all secretions. Not only do these mechanically prevent contact, but chemically they impair the activity of most agents. With the nitrate of silver, nitric acid, tannin, iron salts, etc. there is formed an albuminate. Iodine in aqueous (or even alcoholic) solution undergoes no appreciable change—a feature which especially recommends it for uterine purposes. The removal of these morbid albuminous secretions is effected by bits of pure cotton or sponge squeezed out of hot salt water, seized in a small probang, bent to a suitable curve.

Fig. 187.



Applicator.

Fig. 188.

Self-retaining Tenaculum for steadying the uterus.

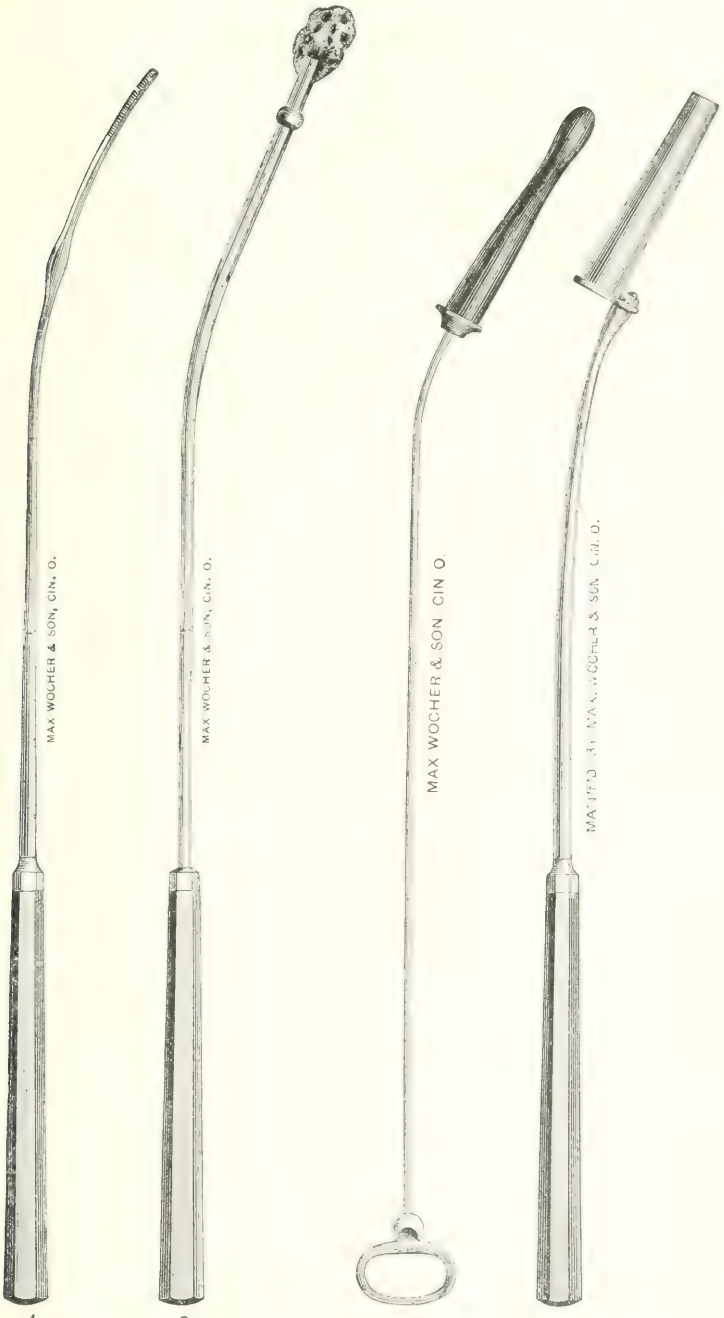
All gynecologists have experienced the difficulties and unsatisfactoriness of applications made even with the aforesaid precautions and care. In spite of our best efforts a certain proportion of the ingested fluid will likely be lost by the contractions of the uterine walls excited by contact of the irritant introduced. Thus, surfaces which we desire to medicate remain partially untouched, and portions of the canal not diseased, and of course not requiring medication, receive the fluids. Accordingly, to obviate these difficulties several contrivances, which keep the cervical walls asunder, protect its canal, and afford free entrance to the corporeal cavity, have been introduced. Such are the instruments of Lombe Atthill, Peaslee, Wylie, Stoops, and others. The author has made use of one fashioned somewhat after the pattern of Atthill's, but with a fixed flexible handle (Fig. 189). The canal is dilated, if necessary, for the introduction of the canula; the cavity above is mopped out with sponge and probang; the rubber applicator, wrapped and saturated with the selected fluid, is passed to the fundus and allowed to remain a few seconds; finally, the applicator is withdrawn to within the canula, and both are then simultaneously removed. For the application of the stronger fluid caustics, nitric acid, chromic acid, etc., this instrument is very valuable, but for the use of solutions of iodine and carbolic acid, with moderate dilatation, it is ordinarily not required.

(*b*) *By the Applicator Syringe.*—This is a method obviating some of the objections and difficulties of the wrapped applicator. It combines the facility of injection, as well as the safety, for the most part, of ingestion. It was first employed by Lente; then, soon after, but independently, by Mundé. It consists in the use of a small, tightly-fitting syringe, capacity of ʒss, with graduated piston, to which is attached a long, slender, flexible rubber tube for introduction through the speculum to the fundus of the uterus (Fig. 190). The syringe is first filled with the fluid to be ingested; then the tube at its extremity is wrapped with cotton in a manner similar to the applicator, and is next introduced within the uterus to the fundus, when the fluid from the syringe is gently discharged into the cotton to saturation. It is not necessary to discharge a quantity sufficient to be seen oozing from the os externum. A saturation of the cotton (a matter which can be accurately determined by previous experiment) implies the contact of the medicament in an undiluted state to the endometrium. If care is taken not to inject a surplus of fluid which may distend the uterine cavity, no more unpleasant results need follow this method than with the simple applicator.

This method is an excellent one for the application of tincture of iodine and carbolic acid, but it ought not to take the place of the protecting canula for the fluid potential caustics.

Hegar and Kaltzenbach have made use of applications of medicated

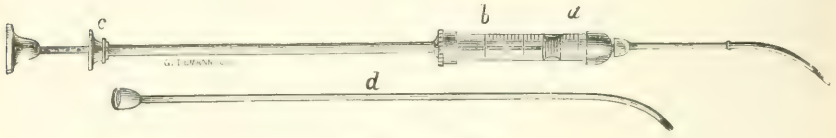
FIG. 189.



Palmer's Intra-uterine Medicator: 1, canula for protecting the cervical canal; 2, plug to facilitate introduction of canula; 3, sponge-holder to cleanse uterine cavity; 4, flexible silver applicator.

lint, and Sims of cotton, by means of his slide applicator (Fig. 191). Such applications are introduced and allowed to remain within the

FIG. 190.



Applicator Syringe.

uterus for from twelve to twenty-four hours. Doubtless, thereby more decided and permanent effects are secured, for not only is the medicament left in contact with the diseased surface for a longer period of

FIG. 191.

Sims's Applicator, with slide.

time, but the uterus is made to contract by the presence of a foreign body.

Fluids used by Ingestion.—These are solutions of iodine, chloride of zinc, nitrate of silver, carbolic acid, chromic acid, and nitric acid. Of these, iodine in the form of Churchill's tincture is one of the most useful, and carbolic acid stands next. Iodine is stimulant, alterative, antiseptic, and hæmostatic. Carbolic acid, a feeble caustic, is one of the most efficacious and safe agents, and is especially adapted to the milder forms of the disease. Playfair, Thomas, and others hold it in the highest esteem.

Iodized phenol, a combination of iodine and carbolic acid, first recommended by Battey in 1877, in proper strength (1 part iodine in 4 parts by weight of carbolic acid), is a most excellent agent. Its chief objection is its disagreeable odor. Solutions of nitrate of silver are more irritant and less useful than in cervical disease.

Chromic and nitric acids are reserved for the severer forms of the disease with patulous canal, granular degeneration, purulent discharge —endometritis villosa, polyposa, hyperplastica, membranosa, hæmorrhagica—cases which probably will resist less active treatment. Nitric acid in its pure state, so highly extolled by Atthill, Kidd, Kennedy, and other British gynecologists, is not so painful or severe an application as might appear; nor is its use, within proper restrictions, more dangerous than that of other agents, and in properly selected cases it is certainly more efficacious. To protect the cervical canal and prevent

cicatricial contraction in the region of the os externum the canula should be employed in the use of nitric acid.

Carbolic acid may be applied once in four to five days; Churchill's tincture and iodized phenol, about once a week during the menstrual interval; the stronger acids rarely oftener than once a month. Too frequent or unnecessary use of nitric acid may lead to cicatrization and early induration of the endometrium.

Solids used by Ingestion.—Various astringents, alteratives, and caustics may be incorporated with lard or cocoa-butter or vaseline in the form of a plasma or ointment, and be ingested by means of a syringe or tube with piston. This is a favorite method of intra-uterine medication with Robert Barnes of London, Fordyce Barker and F. D. Lente of New York. The application of all ointments is disagreeable, and in point of efficaciousness they rank much inferior to fluids.

Instead of ointments, medicated crayons, pencils, suppositories, and pastilles, containing carbolic acid (grs. ij), zinc sulphate (grs. j–ij), iodine

FIG. 192.

Applicator Syringe for fluids or ointments.

(grs. j–ij), and iodoform (grs. iij–v), have been used. The last-named remedy is highly recommended by Fordyce Barker for the menorrhagia of the climacteric dependent upon endometrial congestion. Iodoform pastilles make sometimes very useful applications for chronic catarrh. These pastilles, properly prepared with gelatin coating, flexible for introduction, yet firm enough to be seized with a speculum forceps, possess all the advantages of this method. Sometimes, when slow in melting, they produce symptoms of uterine colic.

Nitrate of silver, in the solid form as a crayon, has frequently been applied within the uterine cavity. Récamier first introduced the practice, and it has been followed by Lallemand, Bennet, Courty, Miller, Byford, Lente, and others. At the present time the practice has gone almost entirely into disuse. Aside from the danger of a portion of the crayon being broken off on account of the strong contractions excited in the uterus, the application itself is frequently followed by the most intense pain. Profuse hemorrhage and peritonitis have likewise ensued. Moreover, the practice of the introduction of a solid stick of the nitrate within the uterus, allowing it to remain and melt, is too hazardous to be countenanced. Occasionally, very little or no pain follows this treatment, probably owing to the fact that the stick, floating as it were in a puddle of secretions of mucus, pus, or blood, is neutralized by them

and does not come in contact with the endometrium. It is a well-established fact that the greater the dilatation and disease of the corporeal cavity, the more tolerant, *cæteris paribus*, the organ is to irritant medication and surgical interference. To say the least, the solid nitrate is less safe than, and has nothing to recommend it before, nitric acid. If used at all, the method of application of fusing it on a flexible probe is to be preferred.

Byford states that he has frequently effected a cure in endometritis complicated by stenosis and flexion by the introduction of tents of slippery elm, which by dilatation overcome the constriction, and also by pressure exercise a salutary influence over the diseased mucous membrane. Each tent is from $1\frac{1}{2}$–$1\frac{3}{4}$ inches long, $\frac{1}{6}$ inch in diameter—small enough to pass through the narrow canal.

B. *Intra-uterine Injections.*—This is one of the most ancient of gynecological usages, advised and practised by Hippocrates some twenty-two hundred years ago, for medicating the interior of the uterus. Subsequently, it was used by others among the ancients, and later on by Ambrose Paré in the sixteenth century; within the past twenty years it has been quite extensively employed. There is scarcely a therapeutic resort so old or one which has passed through so many phases of practice—to be forgotten, revived, then rejected, and finally reintroduced and indorsed.

If the healthy uterus be injected with fluid, the following symptoms will probably be noticed: Uterine pain and colic, abdominal tenderness, feeble, frequent pulse, coldness of the extremities, nausea and vomiting, and other indications of shock. The intensity of these symptoms will vary according to the quantity and force of the injection, the character of the fluid, and the special susceptibility of the person. That their occurrence does not entirely depend upon the quantity or irritating character of the fluid is evidenced by the fact that at times they are manifested where its quantity is very small and it is most bland. If the uterus is diseased with chronic inflammation, these symptoms are apt to be provoked with less severity, or may be absent altogether, according to the size of the cervical canal for exit of the fluid, the capacity of the uterine cavity for its reception, and the presence of various secretions to neutralize the injection.

Numerous reasons, worthy of notice, have been advanced in explanation of these morbid phenomena:

1. Penetration of the Injected Fluid through the Oviducts into the Peritoneal Cavity.—Many experiments at different times have been made to test the possibility of this accident. Vidal first operated upon the cadaver, and found that with moderate pressure the fluid did not so enter. Hennig's experiments coincided. Klemm could make the fluid pass through the Fallopian tubes only on great pressure. The author

has repeatedly made similar experiments by constricting with a stout cord the cervix around a tube fitted to a strong air-tight syringe. No fluid could be forced through the oviducts unless they were dilated.

If such difficulties are encountered in the dead subject where there is no instinctive contraction of the sphincter at the metro-salpingian orifice, how much greater will be those met with in the living! Now, do intra-uterine injections ever so penetrate in the living subject? As the uterus when injected is usually diseased in some way or contains morbid materials, and as under these conditions the orifices of the organ are frequently dilated, it follows that in a certain rare proportion of cases penetration of the fluids to within the abdominal cavity does occur. Post-mortem examinations and Lawson Tait's operation prove the existence of patulous and dilated tubes. Von Haselberg, Barnes, and others report cases where, on autopsy, solutions of iron salts were found at the fimbriæ. But, notwithstanding these admissions and provings, evidently the symptoms cannot be traced, except possibly in rare instances, to such causes.

2. Penetration of the Uterine Veins.—An impossibility in the healthy uterus, unless under the influence of the greatest force, but an admitted possibility in certain morbid conditions of the organ.

3. Entrance of Air into the Veins and General Circulation.—Likewise possible when the mucous membrane is exfoliated, veins are enlarged from disease, pregnancy, or after parturition or abortion. The experiments of Klemm tend to confirm the possibility that injected fluids with a constricted cervical canal may be more easily driven into the venous system than into the oviducts.

4. Acute Inflammations: Peritonitis, Phlebitis, Endometritis.—The rapidity of the occurrence of the symptoms precludes the acceptance of this explanation. These inflammations do often occur after intra-uterine injections, and they are the most common immediate causes of a fatal issue; but such lesions are not the direct and immediate cause of the first phenomena.

5. Rapidity of Absorption.—Certain medicines, as solutions of iodine, carbolic acid, chromic acid, acid nitrate of mercury, etc., may be quickly absorbed into the general circulation and produce evidences of poisoning. Iodine, applied to the uterine cavity even more than to the cervix, is not uncommonly tasted by the patient, owing to its rapid absorption. A denuded mucous surface, large and superficial blood-vessels, greatly facilitate this action. But absorption does not always take place, and if it did could not always do harm. Violent symptoms may supervene on the injections of pure warm water.

6. Shock.—The uterine cavity in a healthy non-gravid organ at the non-menstrual interval is no cavity at all. In normal menstruation it holds but a few drops of blood. Only when diseased by some morbid

growth or accumulating secretions is there a real cavity. Injection of a healthy organ is attended by an abrupt separation of the coaptating walls—a distension of the cavity. If the quantity is in excess of a few minims, and a certain portion is retained, contractions are excited to empty the uterus. The sudden entrance of a foreign substance, rapid distension and contraction, imply irritation of the hypogastric plexus of the sympathetic—shock. This is the most plausible theory, under all the circumstances, that we have. It is the only tenable one to explain the phenomena as presented in healthy subjects. It is satisfactory, too, as showing why these phenomena are less severe or absent when the injection enters a dilated cavity, mingles with morbid secretions, or readily finds an exit.

In view of these facts various precautions can be observed which tend to prevent the ill effects of intra-uterine injections:

1. Dilatation of the Cervical Canal.—Whether this is the result of the disease or is accomplished artificially by tents, it matters not, so that the injected fluid readily flows out of the uterus, retention and distension thereby being prevented. For manifest reasons, it is more dangerous to inject the uterus when flexed.

A ready exit of the current is also secured by the use of a double canula. There are a number of devices, as Nott's, Byrne's, Skene's, and others. The one used by the author since 1870 readily permits of a reflux current, and with it retention with distension is impossible. The canula is fitted to an air-tight syringe with the capacity of half an ounce. (See Fig. 179).

2. Shock is diminished by using fluids at a temperature of at least 95°–98° F.

3. Distension and shock are diminished by injections in small quantities administered slowly, gently, drop by drop.

4. The possibility of injecting air is prevented by using a perfect instrument and thoroughly filling it.

By an observance of these precautions are intra-uterine injections safe? Doubtless by them the dangers in a large degree are avoided; consequently, they should be complied with in all instances where resort is had to this method of medication. But even then, with the greatest possible care and precaution, occasionally uterine pain and colic, symptoms of rapid absorption, with subsequent development of metro-peritonitis, etc., will arise, terminating, it may be, fatally. There are those who have been so fortunate and skilful as to have encountered no such accidents in a large experience. Authorities in high position still utilize this method of intra-uterine medication, but a verdict made by a large majority of gynecologists of to-day, based upon accumulated personal experience, is against the method except in rare cases. Chronic endometritis is an affection not of danger, but largely one of incon-

venience. In its management no practitioner is warranted in assuming unnecessary risks, which these injections unavoidably imply. Moreover, the method is ordinarily unnecessary, inasmuch as, even if safe, it is not superior to that by ingestion.

What, then, are the circumstances in which intra-uterine injections in the non-gravid state are justifiable and beneficial?

1. Cases of threatened or actual septicæmia the result of decomposing material within the uterus, life being endangered. Here the injections, because of a patulous canal, are less hazardous than usual. Even if as dangerous they would be justifiable, for the reason that the practice is attended with less risk than is the disease unchecked.

2. Cases of uterine hemorrhage otherwise uncontrolled.

The agents used for septicæmia are solutions of carbolic acid, potassic permanganate, and mercuric bichloride; for hemorrhage, hot water, hot vinegar, tincture of iodine pure or diluted one half. For the latter class of cases the number of instances in which injections will be deemed necessary must be very small, in view of other valuable and safe resources at hand.

If untoward symptoms unavoidably arise, they are to be met by the use of morphina hypodermatically, internal stimulation, and external heat.

The curette, judiciously employed, is one of the most valuable of all our therapeutic resources in the management of chronic endometritis. Often, its use should precede local uterine medication; it may render the same entirely unnecessary, and not unfrequently will it effectually control conditions of the uterine cavity—endometrial thickening, softening, and granulations attended with hemorrhage—which topical treatment of any kind fails to relieve. The indications for, and uses of, this instrument will be referred to in full under the subject of Uterine Fungosities.

We must not fail to remember that chronic corporeal uterine catarrh may be not only started, but maintained, by a cervical laceration or uterine displacement, and to cure the catarrh we must remove the cause.

Contraindications, Dangers.—Intra-uterine medication of any kind by ingestion or injection is contraindicated when the uterus or the perimetritic tissues are especially tender. Before such interference is commenced all tenderness, due to acute congestion of the uterus, or lurking inflammation in the surrounding cellular or peritoneal tissues, should be removed by rest, the hot douche, saline purgation, counter-irritation, and sedative medication. There is always increased danger of exciting a new attack of perimetritic inflammation—generally peritoneal—in every instance where this disease has previously existed, although, seemingly, all evidences of it have become effaced.

Intra-uterine medication and curetting are most decidedly contraindicated when the uterus is more or less fixed from inflammatory exudations and adhesions.

Intra-uterine treatment should, at the commencement, be mild and tentative, in order to test special individual susceptibilities. For the same reason such treatment is better initiated at the patient's house. There is the greatest variation in point of sensitiveness in different patients. With some the least interference for exploration and treatment excites unexpected disturbance; with others much manipulation is borne without any unpleasant symptoms. When the menstrual period is impending, the nervous and vascular systems being at the acme of excitability and tension, then, above all other times, slight causes are capable of provoking undue reactions.

Proper precautions as to the time of applications, exposure, and exercise afterward should be observed in all cases.

The question of intra-uterine medication is one of the most important and serious within the domain of uterine therapeutics. The author has endeavored to present a fair status of the subject in the face of accumulated and sifted facts. Amid the great variety of opinions, apparently based upon experiences, the beginner is put at a loss to know what course to pursue. As will be inferred from the foregoing pages, the author is not disposed to side with either extreme of practice—not with those who would altogether discard intra-uterine treatment, or with those who adopt it in all cases where the upper cavity is seemingly diseased. Truth here, as elsewhere, lies in the middle ground. Without doubt, immense harm has been done and many valuable lives have been sacrificed by injudicious and uncalled-for local treatment. That it has been used too frequently—used to be abused—is freely admitted. That it can be omitted in not a few cases in which formerly it was deemed necessary, and that in these cases better results in a safer way can be obtained by other methods, should not now be denied. But the reaction against intra-uterine medication has probably gone too far. With a proper selection of cases, and with due restrictions and precautions, intra-uterine medication is of great service in many cases—a service too valuable to be laid aside and ignored. In this department of practice most forcibly does it behoove us that in our efforts to do good we do no harm.

Bibliography.

ARAN: *Malad. de l'Utérus.*

ATTHILL: *British Med. Journ.*, Jan., 1873.

BARKER: *Transac. Am. Gynecolog. Soc.*, vol. iv. p. 67 *et seq.*

BARNES: *Diseases of Women.*

BATTEY, ROBERT: "Intra-uterine Medication," *Am. Gynecolog. Transac.*, vol. iv.

BENNET: *Inflammation of the Uterus.*
BERNUTZ AND GOUPIL: "Diseases of Women," *Transactions of Sydenham Soc.*, 1857.
BYFORD: *Diseases of Women*, p. 324 *et seq.*
COURTY: *Malad. de l'Utérus.*
EDIS: *Diseases of Women.*
EMMET: *Principles and Practice of Gynecology*, 1884.
FRITSCH: *Diseases of Women*, 1883.
GOODELL: *Lessons in Gynecology*, pp. 118, 119.
HART AND BARBOUR: *Manual of Gynecology.*
KAMERER: "Treatment of Uterine Catarrh," *Am. Journ. Obstetrics*, vol. ii. p. 185.
KLOB: *Pathological Anatomy of Female Sexual Organs.*
MILLER: "Retrospect of Uterine Pathology," *Am. Journal Obstetrics*, vol. iv.
MUNDÉ: *Transac. Am. Gynecolog. Soc.*, vol. iv. p. 71, and *Minor Surgical Gynecology*, 1885.
NOEGGERATH: "Latent Gonorrhœa in the Female Sex," 1873; also, *Transac. Am. Gynecolog. Soc.*, 1876.
NOTT: "Treatment of Endometritis by Uterine Injections," *Amer. Journal Obstet.*, vol. ii. p. 470.
PLAYFAIR: *London Lancet*, Jan., 1873.
PEASLEE: *New York Med. Journal*, July, 1870.
ROUTH: "Fundal Endometritis," *London Obstet. Transac.*, vol. xii.
SCANZONI: *Diseases of Females.*
SCHROEDER: *Diseases of the Female Sexual Organs.*
SIMPSON, SIR JAMES Y.: *Diseases of Women.*
SMITH, TYLER: *On Leucorrhœa.*
TAIT, LAWSON: *Diseases of the Ovaries*, 1883.
TILT: *Uterine and Ovarian Inflammation.*
THOMAS: *Transac. Amer. Gynecolog. Soc.*, vol. iv. p. 79 *et seq.*, and *Diseases of Women.*
WEST: *Diseases of Women.*

ULCERATIONS AND DEGENERATIONS OF THE CERVIX UTERI.

Intimately connected with the subject of chronic cervical endometritis is that of ulcerations and degenerations of the cervix. So much disputation and misunderstanding having occurred concerning the true pathology of the affections of the cervix called ulcerations that it seems proper to give a more full and distinct mention of them. Within recent years new views of their pathogenesis, based upon microscopical investigation, have been advanced which seem destined to revolutionize our previous ideas.

NORMAL ANATOMY.—The vaginal portion of the cervix is covered with layers of squamous epithelium resting upon papillæ of connective tissue. Slender blood-vessels pass into each and form vascular loops on their extremities; then, returning, pass into adjoining papillæ. According to some, mucous crypts are found, though this is denied by De Sinéty. Ruge and Veit also consider their existence as pathological.

The cervical canal is lined with a single layer of epithelium, ciliated on its free surface, folded so as to form shallow recesses. There are numerous racemose mucous glands with branching ducts. The substance of the cervix is made up largely of connective tissue.

Pathological Anatomy.—The exact steps, according to the old and generally accepted view, in the pathological processes of chronic cervical catarrh by which, through the influences of increased and altered secretion of the cervical follicles, the infravaginal mucous membrane becomes macerated, exfoliates its epithelial layer, and proliferates its papillæ, etc., have been referred to. It becomes now our duty to speak of the results of modern microscopical investigations, and to show why the recently-advanced opinions may be accepted.

Much of the dispute among authorities as to whether these changes are ulcerative or not, or whether "ulceration of the womb" is a common condition, is a contention about non-essentials, and arises from a misunderstanding among the disputants as to what each considers ulceration. Dunglison defines an ulcer as a solution of continuity in the soft parts. The exact extent and depth of this solution of continuity ought not to be the points at issue. Is there any solution at all? A simple destruction of the epithelial layer, from whatever cause, of whatever duration, is an ulcerative process, superficial though it be.

Now, it appears that the acceptance of the doctrine of any destruction of tissue is based upon naked-eye appearances during life and microscopic examination of specimens taken from dead bodies, in which the epithelium has been macerated and removed.

Careful investigations of Ruge and Veit, who have examined specimens freshly cut from the living subject, have demonstrated that the apparently raw surface seen through the speculum is covered with epithelium, and that the granular points supposed to be hypertrophied papillæ are not connected therewith, but are new formations. The appearances, as described by them, are as follows: The seeming erosions are covered with cylindrical cells, small, long, and narrow, having a palisade-like arrangement. This layer of cells is thin, and allows the subjacent vascular tissue to shine through; hence the bright-red color. The key to the discrepancy as to how pavement epithelium is converted into cylindrical is furnished by recognizing the fact that acinous glands are found in this portion of the cervix externally, and especially internally. The glandular epithelium proliferates and covers the parts denuded. The cylindrical epithelium may detach the pavement epithelium, crowding between it and the underlying tissue. An enlarged gland with spreading orifice displaces the pavement epithelium, so that an area of protruding and proliferating glandular lumina is seen. Thus, cylindrical epithelium seems to possess a much greater energy of growth than pavement epithelium, displacing the latter and occupying territory where not originally found.

Abrasions, Erosions.—The raw-looking surface called abrasion or erosion is therefore only a newly-formed glandular secreting surface,

resembling the cervical mucous membrane. Being a practical addition to the extent of area of secretion, it necessarily increases the leucorrhœa. These so-called abraded surfaces are bright red, circular or generally irregular in shape, situated around the external os, more frequently the posterior cervical lip, with edges sometimes well defined, and often bleeding easily when touched.

Granular Degeneration.—This is really no ulceration at all. Great proliferation of the cylindrical epithelium or of the glands causes protuberances to arise. The surface is further thrown into numerous folds, producing glandular recesses and processes—glandular lumina which have proliferated outward. Such are papillomatous erosions, the surface of which has a granular appearance. The condition provokes a persistency and intensity of the morbid action—hyperæmia and increased secretions.

These granulations are soft to feel, of a vivid red color, show great vascularity, and rise above the surrounding surfaces. They sprout up mostly around the external os, but may extend through the cervical canal. At times they take on great luxuriance and look like raspberry formations. Excessive development characterizes the so-called "fungoid ulcer," which when pressed upon and flattened down presents the appearance of a cock's comb, called by the English writers "cocks-comb granulations." "Varicose ulcers" are also spoken of. They are distinct varicose venous plexuses ramifying over the hypertrophied papillæ. Phlyctænæ (Lisfranc), aphthæ and herpes (Lisfranc and Robert), pemphigus (Joulin), are mentioned. Thus, the great variety of appearances in the color, extent, and degrees of intensity of the morbid action found in these pseudo-ulcerative lesions has tempted authors to classify them like surgical ulcers, but there is no practical significance in such an arrangement.

Frequency.—Like the disease from which they ordinarily proceed, these degenerations of the cervix are the most frequent of the uterine affections. They attend a large proportion of the cases of chronic uterine leucorrhœa, whether the discharge is cervical or corporeal. They likewise complicate parenchymatous inflammation of the cervix, and are almost invariable concomitants of laceration of the cervix.

Etiology and Symptoms.—Essentially, the same causes produce and the same symptoms attend erosions and granular degenerations as attend cervical endometritis.

Physical Signs and Diagnosis.—To the touch, the cervix feels softer, velvety-like, or granular, having lost its natural smoothness and firmness. Through the speculum the parts are seen covered with a thick, cream-colored pus, which after removal gives an appearance to the cervix around the os of intense redness and vascularity, the velvety granulations being raised above the surrounding surface.

Such are the signs in nulliparæ, and also multiparæ, when the understructure of fibrous tissue is not diseased or lacerated. If, however, these conditions named should be present, the cervix will be more or less enlarged, thickened, and nodulated from hyperplasia and erosion.

The gross appearances are so characteristic that the diagnosis is easy; yet cervical laceration with ectropion is very liable to be mistaken for granular degeneration, so nearly do they resemble each other. As on a proper diagnosis the results of treatment depend, the crucial test for laceration should be made.

Granular degeneration is easily confounded with cervical epithelioma in its earlier stages.

Prognosis.—Granular degeneration is one of the most amenable of uterine affections.

Treatment.—The diagnosis having been clearly established whether the degenerate changes of the cervix are primary or secondary, the indications for treatment become well defined. If the latter, as the result of uterine displacement, a badly-adjusted pessary, a persistent acrid discharge from the uterine canal, a laceration with erosion of the cervical lips, etc., these should be first corrected before any hope can be indulged toward the accomplishment of a complete or permanent cure. The effects will be repeated so long as the cause remains. The benefits which accrue from a replacement of the uterus, the adjustment of a well-fitting pessary, the repair of a laceration, rest from coitus, etc., are examples of what can be done by a removal of the cause. While the ulterior condition is receiving attention the granular degeneration itself must not be neglected. To both cause and effect the treatment is directed.

In all cases it is of paramount importance that the infravaginal cervix and vaginal canal be kept clean, free from accumulating secretions. The rules to be observed in the employment of vaginal injections have been laid down. The medication of the water with various astringents, tannic acid, zinc sulphate, lead acetate, with such emollients and antiseptics as boric acid, sodic biborate, glycerin, etc., is highly advantageous.

The morbid condition is often most speedily brought to a favorable termination in initiating the local treatment, not by the use of astringents and caustics, but by depletion. This is especially true if the granular degeneration is marked and the cervix shows signs of decided hyperæmia. If the granulations extend throughout the cervical canal, several scarifications with a narrow-bladed knife should be made over each wall, from just below the os internum down to the os externum and over such portions of the infravaginal face of the cervix as are implicated. Congeries of superficial blood-vessels are thus divided, the flow of blood is free, and the vessels are emptied. Congestion is

diminished. Puncturing may be practised instead of scarification, or both may be utilized at the same sitting. If the granulations are large and exuberant and fill up the os and canal, they are best treated by free excision with the scissors and scraping with a sharp curette. Such treatment may be repeated at proper intervals. When the local improvement is sufficiently advanced, further treatment may be followed up by topical applications at proper intervals of emollients, as bismuth subnitrate, boro-glyceride; of astringents, as tanno-glycerin, glyceride of alum, or Richardson's styptic colloid; by alteratives, as tincture of iodine, iodoform; and by caustics, as nitrate of silver in solution or crayon, pure carbolic acid, nitric acid, or chromic acid.

Mucous tissue, much hypertrophied, protruding and everted, is best treated by thorough excision.

Cystic Degeneration.

This is a degenerate change of the mucous follicles of the cervical canal and the infravaginal face of the cervix. Granting that there are no racemose glands on the vaginal portion beyond the limits of the os externum, the degenerate follicles there found in this disease must be produced from the mucous membrane of the cervical canal or from the newly-formed glandular tissue.

Pathology.—The changes are variable, and indicate degrees of the pathological processes. First, there are a number of vesicles, in size from a millet-seed to a pea, filled with a thick gelatinous fluid due to repletion from retention. The secretion becomes inspissated. The efferent duct of the gland becomes compressed by the swollen peri-glandular tissue, as well as by the neighboring glands. A retention-cyst is formed called "ovulum Nabothi." The development of these retention-cysts is hindered by the great resistance of the tissues; hence their formation is most readily effected at the surface. Second, the cysts have opened, either spontaneously by internal pressure or by trauma; the cylindrical epithelium is laid bare—follicular erosion; or their contents may undergo suppuration and form minute abscesses.

If the tissues are very firm the cysts elevate themselves from the parenchyma. Hanging from the os, they assume the shape of small polypi. They may gradually acquire a long stem, and several sections of the gland may proliferate.

Thus, cystic degeneration is glandular hypertrophy, and the formation of new glands is resultant on the epithelial proliferation previously described. The growth of the glands, whether from the internal surfaces of the cervix or from underneath the squamous epithelium, is sometimes enormous. So great may be the glandular hyperplasia involved that the entire vaginal cervix may be converted into one

cystic mass, a cavernous tumor, the connective tissue having been effaced. A section of the cervix, as in amputation, may thus cut through innumerable retention-cysts filled with mucus. The whole exterior surface secretes large quantities of mucus.

Fritsch describes this enormous hypertrophy which takes place in the glands of the cervix, so that the part becomes almost an adenomatous structure. A persistency of this condition after the puerperium partly explains the frequency of chronic cervical catarrh in multiparæ.

Etiology.—The causes of cystic degeneration are chronic congestion and hyperplasia of the cervix, chronic cervical endometritis, and especially lacerations.

Diagnosis.—Touch may be sufficient to detect the enlarged follicles on the exterior of the cervix or within the cervical canal. The speculum will confirm the diagnosis.

All of the above-mentioned pathological changes may be revealed in a single case.

The prognosis is favorable.

Treatment.—The first step consists in thoroughly emptying the distended glands. This is best done by freely puncturing each cyst with Buttle's scarificator or a knife with small-pointed blade. It is useless to attempt to search for each individual cyst, for the whole degenerated or ulcerated surface may be passed over by numerous little stabs in all directions at each sitting, and the process repeated from once to twice each week until a radical improvement is effected. The local bleeding is rarely free, and in itself is beneficial. Not only will the cervix now present an improved color, but be reduced in size, and the everted flaps from laceration assume a better shape.

Cauterization of each cyst-cavity with nitrate of silver or pure nitric acid is rarely necessary, but may be reserved for the more rebellious cases.

Applications of tanno-glycerin and strong tincture of iodine, as described under the subject of Chronic Cervical Endometritis, are very useful.

Failing to arrest the degeneration by these means, an effort should be made to extirpate the glands of the cervical canal by thorough scraping with a sharp steel curette, followed by free cauterization with the hot iron; or, as a last resort, the infravaginal cervix may be amputated by scissors or the galvano-caustic wire.

The importance of a thorough eradication of the cystic degeneration of the cervix following laceration before trachelorrhaphy is undertaken cannot be over-estimated, since its continuance is very apt to endanger an otherwise successful result of this operation.

True Ulcerations of the Cervix Uteri.

A true ulcerative process, with destruction of the epithelium and underlying tissues, does sometimes, though rarely, occur. Of course reference is not had to ulcerations consequent on malignant disease—a condition very common.

SYPHILITIC ULCERATIONS.

If there is any point in uterine pathology well settled, it is that syphilitic ulcerations are exceedingly rare in this region. Not only is this true as to the primary sore—chancre or chancroid—but secondary formations, as mucous patches, acknowledged to be the most frequent of all the manifestations of this stage of this disease, are very infrequent. The testimony of most observers agrees as to these points, and in substantiation such authorities as Ricord, Cullerier, Duparcque, and Bumstead may be cited. But some statistics offered by Fournier would indicate their greater frequency.

When present, true syphilitic ulcerations may be recognized by the usual evidences of a well-defined border, which is indurated, surrounding a depressed area, manifesting a great tendency to be covered with false membranes, as has been observed by Robert and Bernutz. According to Ricord, they are found more often on the anterior than the posterior cervical lip. Commencing as a simple erosion, they quickly become deep ulcers, and, according to Förster, may perforate the bladder and the rectum. Constitutional symptoms rapidly develop.

The DIAGNOSIS rests upon the appearance of the ulcer, its rapid progress in one previously free from local trouble, the quick development of constitutional symptoms, and its inoculability.

Secondary eruptions, as mucous patches and vegetations, are recognized by their rapid local development, associated with characteristic constitutional signs.

What, now, is the nature of the abrasions and granular degenerations so frequently found in patients suffering with constitutional syphilis? They are the same in kind and degree detected in women who have no syphilis. They arise from common causes, local and general—sexual abuses, dissipation, habits of uncleanliness, and impaired general health.

TREATMENT.—Non-specific ulcerations may be treated like pseudo-ulceration. Specific ulceration requires antisyphilitic medication.

Bibliography.

BARNES: *Diseases of Women*, 1878.
BUMSTEAD: *Venereal Diseases.*
DE SINÉTY: *Practical Manual of Gynecology*, Paris, 1879.
FRITSCH: *Diseases of Women*, 1883.
HART AND BARBOUR: *Manual of Gynecology*, 1886.
RUGE AND VEIT: *Pathology of Vaginal Cervix.*
THOMAS: *Diseases of Women*, 1880.

Uterine Fungosities.

Intimately associated with, and dependent upon, some of the varieties of chronic endometritis of the corporeal cavity are fungosities or a fungoid degeneration of the endometrium. It is a disease of great frequency, and its recognition affords a key to not a few cases of menorrhagia, metrorrhagia, and leucorrhœa. Fungosities proper are not found in the cervical canal.

Pathology.—The conditions found are variable. At times (*a*) there is a thickened, pulp-like state of the mucous membrane—a uniform general hyperplasia of the whole surface, without any projections. Again, (*b*) there are found sessile vegetations, in size from a millet-seed to a pea, studding the mucous surface in patches or spread over the whole area. They are red, gelatinous-like, and eroded by chronic catarrh, and have an abundance of vascular supply. And (*c*) there are numerous projections of fungoid material, polypoid-like, scattered over a hyperplastic mucous membrane.

Olshausen termed this disease endometritis hyperplastica chronica, seu polyposa. Microscopically, he describes these fungosities as hypertrophied mucous membrane, with an increase of all its histological elements—dilated follicles, enlarged blood-vessels, and great cell-proliferation. Slavjansky has styled the disease metritis interna villosa. All these three neoplastic formations may be combined.

Placental villosities are very frequently detected in the uterus, especially after abortions at the second to the third month; more rarely after term. The symptoms of their presence are the same as from uterine fungosities, and it is difficult to differentiate between them. Retention of adherent placental villi is a common source of endometritis hyperplastica.

Finally, diffuse or soft sarcoma of the corporeal mucosa, and adenoma, a glandular disease, may be present. Both are rare affections, and both, especially the former, manifest, even when seemingly wholly removed, a strong tendency to return. The diffuse sarcoma shows soft, flabby, villous growths, assuming an irregular polypoid shape, spreading over the whole surface, rapidly proliferating.

Etiology.—Chronic endometritis is unquestionably the most common cause. Associated with endometritis, there may be a subinvolution of the uterus. Displacements and flexions, either as the result or cause of chronic hyperæmia, are etiological factors.

These fungosities are noticeably frequent in marked retroflexion and retroversion. Intra-uterine and interstitial fibroids, which enlarge the uterus and augment its blood-supply, lead to similar changes in the mucous membrane.

A neglected laceration of the cervix, if sufficient to produce gaping of the cervical walls and eversion, is almost invariably thus complicated.

Enforced sterility, implying a disregard of Nature's laws, demanding stated periods of rest which alone pregnancy and lactation can bring, is a cause. In fine, prolonged uterine congestion, from whatever cause or condition, is the chief underlying causative influence.

Symptomatology.—The most significant symptom is uterine hemorrhage, which holds no proportion either to the number or size of the fungosities. The menstrual flow may be greatly increased, prolonged, or appear with increasing frequency. Metrorrhagia or non-menstrual uterine hemorrhage may supplement the menstrual flow proper, the hemorrhage thus becoming continual. More or less fungoid material may be cast off spontaneously, mixed with blood. In the absence of hemorrhage there is generally more or less mucous or muco-purulent leucorrhœa. The remaining symptoms are such as are present in ordinary endometritis. Sterility is the rule. As a consequence of the local drain the general health becomes greatly depreciated and anæmia may be profound.

While uterine fungosities are a condition particularly of the child-bearing years, it is occasionally perpetuated long after the climacteric.

Diagnosis.—The rational symptoms create a strong suspicion of the nature of the disease. The uterus is somewhat enlarged, tender, and the canal patulous, and there is catarrh. The entrance of the index finger through the dilated canal may enable one to feel the soft, spongy endometrium.

A confirmation of the diagnosis is reached by a physical exploration of the uterine cavity made with the wire-looped curette gently passed down over the walls and within the angles of the horns of the uterus. To the touch a roughened sensation is communicated as the curette glides over the diseased surfaces. Portions of the diseased membrane or placental villosities, as the case may be, will be removed. This is the only sure test of the existence of these fungosities. A gentle scraping will dislodge them if present; if there are none, no harm is done.

To the experienced eye the appearance of the morbid material removed is sufficient. Either it will be surfaces of thickened, softened, hyperplastic mucosa, patches of low soft granulations, polypoid formations, placental villosities, if benign, or villous growths if sarcomatous; glandular formations if adenomatous. Any doubt as to the exact nature of each may be solved by a careful microscopical examination, the histological features being characteristic.

The quantity removed may be very slight, up to one and several teaspoonfuls. The regions of the uterine cornua seem to be favorite seats for their localization; also, the site of the placental attachment in those cases which have followed abortions and parturitions at term.

Prognosis.—This is almost always favorable, provided a correct diagnosis is made and a proper course of treatment is instituted. The

prognosis is certainly favorable if the diagnosis settles the benignity of the fungosities; equally unfavorable if they should prove to be sarcomatous.

It is always well to bear in mind that the disease is liable to return, and treatment may have to be repeated from time to time in a certain proportion of cases, especially when the uterine engorgement from any cause cannot be effectually controlled. Where resultant on flexion or a constricted cervical canal permanent relief cannot be expected until the original affection is remedied.

Treatment.—The one essential feature of the treatment of uterine fungosities is their radical removal. Constitutional treatment, except for the purpose of improving the general health, is of no avail, and intra-uterine cauterization is uncertain and unsatisfactory. The stronger caustics may destroy these granulations, but, aside from the danger arising from repeated cauterizations, and this tendency to the formation of hard, cicatricial mucous membrane, the curette treatment is less painful, more rapid, more safe, convenient, and effectual.

Use of the Curette: Indications, Contraindications.—Récamier of Paris in 1846 had the honor to introduce the curette, which original instrument (Fig. 193) has largely gone into disuse. For a long time

Fig. 193.

Récamier's Curette.

its use met with much opposition, having been pronounced unscientific and barbarous by such men as Chassagnac, Scanzoni, and others. Within recent years the instrument has been greatly modified and its use rendered perfectly safe. Those at hand are the dull wire curette of Thomas (Fig. 194); the sharp steel curette of Sims (Fig. 195), with

Fig. 194.

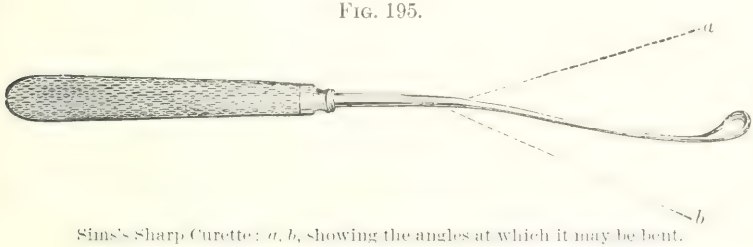
Thomas's Curette.

flexible handle; the sharp cutting spoon-curette of Simon (Fig. 196), with a stiff shank; and the curette forceps of Emmet (Fig. 197).

Thomas's instrument of copper wire, without cutting edge, is now in general use, and quite justly so, answering as it does not only for the purpose of a thorough diagnosis, but in the great majority of cases being all-sufficient to safely and effectually dislodge the fungosities. Sims's sharp curette should be reserved for the destruction of hyper-

trophied glands of the cervical canal and those rare instances of diseased upper endometrium where, after repeated failure with the dull wire instrument, a more powerful impression and thorough removal of hypertrophied mucosa are necessary. Never should it be selected to

Fig. 195.



Sims's Sharp Curette: *a*, *b*, showing the angles at which it may be bent.

initiate curette treatment unless it be for the removal of sarcomatous growths. Emmet is very severe in his denunciation of Sims's instrument, stating that "the ingenuity of man has never devised one capable of doing more harm"—an expression doubtless true if it is

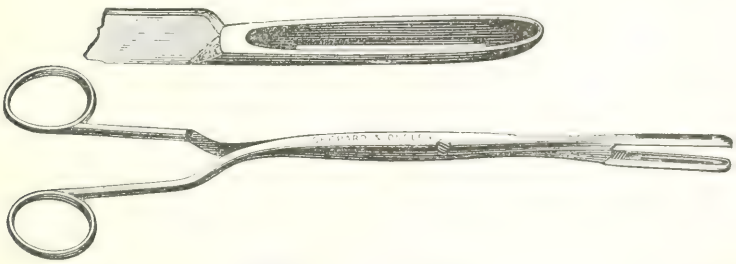
Fig. 196.

Simon's Spoon.

employed by unskilful hands or as frequently as is the dull wire curette. But the sharp curette is by no means to be laid aside and abandoned. It has its place and power.

Emmet's curette forceps, introduced as a substitute for Sims's curette,

Fig. 197.



Emmet's Curette Forceps.

removes only such granulations as project above the common level of the surrounding membrane.

Simon's spoon-curette was designed (1872) for the removal of malignant growths. Modifications of it with serrated edges possess special advantages.

Any one of these curettes can be employed without the speculum,

but the proper application is best obtained by the use of Sims's speculum in the left lateral semi-prone (or Simon's) position, the uterus being steadied with a tenaculum. Artificial dilatation is seldom required. The curette is made to systematically scrape all the uterine walls from fundus to os internum, not neglecting the regions of the metro-salpingian orifices. Its withdrawal is followed by the fungoid villous accumulations or the hyperplastic mucous tissue, and more or less flow of blood. Rarely is the latter profuse, and it generally quickly ceases. This loss of blood is not only protective, but is directly beneficial in depleting from the congested endometrium. Varicose vessels ramifying upon the surface are thus broken up, and many others are emptied.

The vagina may now be irrigated with a stream of hot water, and, if necessary, intra-uterine medication with iodine tincture, carbolic acid, iodized phenol, or nitric acid may be inaugurated—always if the growths are found to be malignant. Comparatively slight pain usually attends this minor operation, an anæsthetic seldom being required. The dangers also are slight. Rarely does an attack of pelvic peritonitis or cellulitis supervene. But the risks of curetting are considerably increased if made to immediately follow tenting. Antiseptic precautions should always be observed. As a matter of ordinary caution it is prudent that this operation be performed at the patient's residence, and that she remain in bed for several days thereafter—longer if any unpleasant symptoms develop.

The effects of curetting are usually very prompt and decided in controlling uterine hemorrhage arising from causes here before described. Quite excellent effects also are produced on the congested mucous membrane even when no fungosities are found. The forthcoming period is at times considerably delayed; more often its first appearing at the ordinary time is profuse, while subsequent ones become normal in quantity. Repetition of the curetting may be necessitated from time to time on account of relapses of the symptoms from re-forming of the vegetations. Thorough removal of old, diseased mucosa favors the regeneration of a new, better structure.

In these more stubborn cases the best results may be secured by following each curetting with one to two intra-uterine treatments of iodine, iodized phenol, or nitric acid. The use of the curette may quite often not only initiate, but entirely supplant, intra-uterine medication.

So great are the benefits to be derived from the proper use of the curette in judiciously selected cases of chronic corporeal disease that its introduction is certainly one of the greatest advances in the management of many conditions heretofore almost unmanageable. The contraindications to its use are the same as for intra-uterine medication.

Bibliography.

COURTY: *Malad. de l'Utérus*, 1883.
EMMET: *Principles and Practice of Gynæcology*, p. 617.
GOODELL: *Lessons in Gynæcology*, 1880.
HART AND BARBOUR: *Manual of Gynæcology*, 1883.
MUNDÉ: *Minor Surgical Gynæcology*, 1885.
THOMAS: *Diseases of Women*.

CHRONIC METRITIS, SUBINVOLUTION, HYPERÆMIA, HYPERTROPHY, HYPERPLASIA, SCLEROSIS, ATROPHY OF THE UTERUS.

DEFINITIONS, SYNONYMS, AND NOMENCLATURE.—The term chronic metritis is used to express a morbid process, formerly universally supposed to be inflammatory, involving the fibrous structure of the uterus. The term is retained, in the absence of a better one, to express its correct pathology. While it is not regarded by most authorities as a true inflammation, it possesses many features like it. The various names or synonyms by which this affection is known are—chronic congestion, hyperæmia; chronic infarctus (Kiwisch); engorgement (Lisfranc); chronic parenchymatous inflammation of the womb (Scanzoni); diffuse growth of the connective tissue (Klob); subinvolution; hypertrophy; areolar hyperplasia (Thomas); irritable uterus (Hodge); diffuse interstitial metritis (Noeggerath); sclerosis; atrophy. Some of these terms are inapplicable, convey most imperfect ideas of the nature of the pathology, and express merely certain symptoms or a single feature of the disease. Strictly speaking, chronic metritis, as now understood, is a complex morbid process embracing different stages and varied conditions. It is the most important disease of the female sexual organs.

PATHOLOGICAL ANATOMY.—Until within recent years it has been supposed that the so-called chronic metritis was but the chronic stage of the acute inflammation of the fibrous tissue of the uterus. The error of such a view is now apparent when we consider the great rarity of acute parenchymatous metritis, as shown by all autopsic examinations, and the clinical fact that most cases of chronic metritis have never manifested any acute symptoms. To recent investigations, chiefly microscopic, in pathology are we indebted for a correct understanding of the morbid processes in this disease.

That chronic metritis can be engrafted upon acute parenchymatous metritis occurring in the puerperal bed is admitted. A uterus enlarged, its muscular walls thickened, soft, pulpy, the cut surface of which would show a bright-red color with engorged veins, the interstices yielding on compression a red exudation, and the muscular fibres infiltrated with pus-corpuscles, presents a condition which may become chronic or lead to the pathological changes detected in chronic parenchymatous metritis. As stated, very few cases afford any such antecedent history. Most

are ushered in so slowly and insidiously that it is difficult to determine the date of inception.

It is to the condition of the uterus after parturition at term or after an abortion that we are to look for an explanation of the processes which lead to many of these cases of chronic parenchymatous disease. The puerperal uterus is large, heavy, flabby, and usually anteverted. The whole organ during gestation has undergone an enormous hypertrophy, its muscular fibres having assumed colossal proportions. It weighs after delivery from twenty-two to twenty-four ounces (Heschl), and measures in length from twelve to nineteen centimeters (four and three-quarters to seven and a half inches) (Boerner). The interior of the organ is bathed with a disintegrating fluid, and the placental site shows large venous sinuses plugged with newly-formed thrombi. The whole interior mucous membrane is not cast off, as was formerly supposed, but a separation in the decidua itself takes place, regeneration commencing from the remaining portion. The new membrane is usually formed during the third and fourth weeks.

The revolution by which this immensely hypertrophied organ is reduced to almost its original size and weight before pregnancy is called *involution*. It is accomplished partly through the drainage of the lochial discharges, but largely through the action of fatty degeneration. The muscular fibres undergo a fatty metamorphosis, in consequence of which they melt down and disappear, being absorbed as fat. This fatty metamorphosis is easily discernible under the microscope in each individual fibre a few days after delivery, commencing in those near the mucous surface and extending outwardly. In a fortnight after parturition the uterine length is reduced to some nine to twelve centimeters (three and a half to four and a half inches), and the weight to ten or eleven ounces. The observations of Boerner, Heschl, and Sinclair go to show that the loss in weight and the diminution in size are comparatively little at the end of the first week, but greatest during the second week, and that at the end of the third the uterus is still three to four times heavier than the non-puerperal organ (one ounce and a half). This whole transformation—one of absorption and regeneration—is ordinarily not completely accomplished short of the end of the second month. It varies much in different subjects, both in the rapidity and degree of its action, being influenced greatly by conditions local and general. It is more rapid and perfect in the primiparæ than the multiparæ. It is also delayed and made incomplete by a poor state of the general health, inherited or acquired. Failure of suckling one's own infant is a hinderance to its accomplishment. The local conditions impeding involution are traumatic lesions of the cervix, retention of portions of placenta, membranes, blood-clot, septic absorption, the supervention of endometritis, uterine phlebitis, pelvic cellulitis, etc.

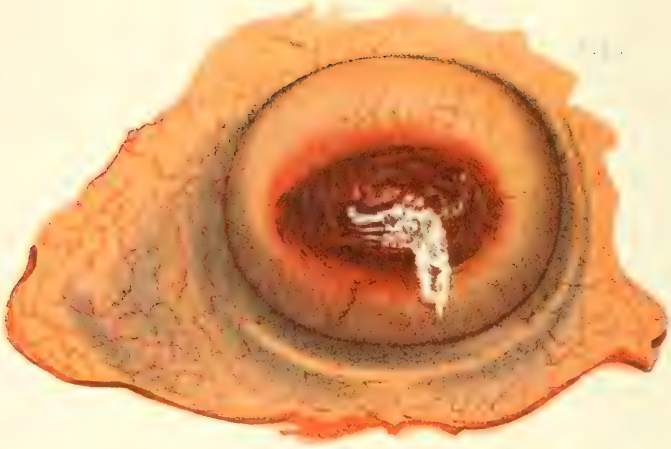


Fig 2

Fig. 1. Chronic Hyperæmia, Catarrh, and Enlargement of the Cervix (Meigs).

Fig. 2. Chronic Metritis and Endometritis (Meigs).

To face page 601.

Arrested retrograde involution is called *subinvolution.*

Precisely the same process in kind, differing only in degree, occurs in the uterus following each menstrual period. There is then menstrual involution, and there may be, in consequence of impeded circulation, *menstrual subinvolution.*

Now, *puerperal subinvolution* of the uterus is the chief underlying condition or factor in the production of the so-called chronic metritis. Anything which interferes with normal involution predisposes to chronic metritis. The prominent feature of subinvolution is increased vascularity—*hyperæmia.* The condition is a chronic one, and may have an indefinite continuance. But its protraction for a long period of time is followed sooner or later by certain changes in the tissues of the parenchyma. At the beginning hypertrophy of the muscular structure, equally with the connective tissue, is found. As time advances—it may be a few months or even years—microscopic section will show a great preponderance of the connective tissue. As a result of the persistent, habitual hyperæmia this tissue takes on this increased growth or proliferation. The same proliferation may follow in the muscular structure, but it is always there limited, and usually absent. The muscular structure is therefore relatively diminished, and it may be absolutely, by the connective tissue supplanting it.

At first, then, the uterus is enlarged, heavy, flabby, soft, and hyperæmic. Later on, as a preponderance of the connective tissue results through its proliferation, the organ is found dense and indurated; at the same time it becomes less vascular. Diminished vascularity is brought about by the growth of the intermediate areolar tissue especially surrounding the blood-vessels, compressing them and cutting off the current of their supply. This, the second stage of the disease, is called *hyperplasia.*

Still later on a further change becomes manifest, the result of the former. Advancing proliferation and hyperplasia of the connective tissue renders the parenchyma of the uterus more and more dense and indurated, less and less vascular, until finally a condition is found as described by Klob. The parenchyma on section appears white or whitish-red, deficient in blood-vessels, and its firmness is so increased by contraction and condensation that it creaks under the knife, simulating the hardness of cartilage. The uterus now grows smaller and undergoes atrophy. This is the stage of sclerosis or cirrhosis.

We, then, may recognize three distinct stages of chronic parenchymatous metritis: 1, hyperæmia; 2, hyperplasia; 3, sclerosis. The second is a result of the first, and the third is a practical continuance of the second. (Plate III.)

From a pathological point of view the term "chronic metritis" has been deemed incorrect, inasmuch as it implies an acute stage of an

inflammation which rarely exists, and since a study of the morbid anatomy has failed to demonstrate the evidences of a chronic inflammation. But, as Hart and Barbour state, the term is very convenient from a clinical standpoint, because we possess none better to embrace a variety of conditions presenting the same clinical features on examination. Very recently, Dr. Mary P. Jacobi has presented an elaborate and strong argument in favor of the older view, that chronic metritis, whether a chronic or the acute affection from the start, is an inflammatory disease. There are, it is claimed, the subjective and objective symptoms of inflammation—pain, hyperæsthesia, heat, redness, and swelling. There are enlarged and multiplied blood-vessels; lowered vascular tension; venous stasis; dilated lymph-vessels; emigration of the leucocytes; transudation of nutritive plasma; secretion, even pus, upon the free surfaces; organization of connective tissue; impaired nutrition—conditions typical of chronic inflammation.

It is impossible to determine at the bedside exactly when the state of subinvolution commences to merge into that of hyperplasia—a slow and insidious development. The two affections, to clinical appearances, resemble each other, and, apart from the history, differentiation is obscure.

Just as the hyperæmia of subinvolution proves so potent a factor in this disease, so may habitual hyperæmia of the uterus from any cause lead to the hyperplasia. To a very great extent hyperplasia is limited to the parous uterus. The normally firm, resisting walls of the nulliparous organ afford a strong resistance to expansion, whether by vascular fulness or cellular proliferation. Still, it is not to be forgotten that this disease may and does occur in the nulliparous organ.

Etiology.—The tendency of the uterus to fluxion[1] and congestion[2] is obvious, and is due to—(*a*) excessive development of its vascular, especially venous system, these veins having no valves; (*b*) the erectile character of its tissues, favoring stasis; (*c*) the low position of the organ; (*d*) pressure upon it by abdominal and pelvic viscera; (*e*) periodical influxes of blood and hemorrhages; (*f*) enormous hypertrophy from pregnancy.

All the causes may be grouped under two heads: 1. Those which interfere with the normal involution of the puerperal uterus at term or after abortions; 2. Those which produce repeated or habitual hyperæmia of the uterus.

Under the first head are—contusions and lacerations of the cervix; retention of the products of conception, as placental masses, membranes, or blood-clots; various metritic and perimetritic inflammations after

[1] *Fluxion* is a temporary accumulation of blood, rapidly appearing and disappearing.

[2] *Congestion* is a more permanent accumulation of blood in the vessels, and may result from fluxion often repeated or strong.

parturition; too early rising after labor or abortion; non-lactation; abortion.

All of these causes imply conditions which are followed by local congestions. Too early resumption of the erect posture leads to passive congestion in an enlarged, flabby organ, arresting involution. The physiological determination of blood to the mammary glands in lactation exercises a derivative influence over the pelvic organs. The direct application of the child to the breast reflexly excites uterine contraction, favoring involution. Involution is relatively more tardy after abortions, in that patients do not afterward observe the same amount of rest, and there is the absence of the stimulus of lactation.

Under the second head are included—chronic endometritis, cervical, corporeal, or general; versions and flexions of the uterus; pressure of certain pelvic or abdominal tumors; chronic cardiac, hepatic, and nephritic diseases; frequent and excessive coitus; constipation; faulty bodily postures; prolonged standing; wearing around the waist of tight and heavy clothing, etc.

Chronic endometritis may be of long standing in the nullipara, and not lead to any special hyperæmia of the parenchyma. Not so if in the multipara. The difference in results is owing to the difference in the tissues of the parenchyma in the two—in the one firm and resisting; in the other more soft and yielding.

Versions and flexions almost always are secondary to increased bulk and weight of the uterus, with its attendant chronic congestion. In turn, these displacements so interfere with the venous flow that there is consequent passive hyperæmia. Either wall or a portion of the uterus, according to the kind and degree of displacement, may take on hyperplastic thickening and induration; for instance, it is the upper and posterior wall which is involved in retroflexion.

Any tumor within the walls or any outgrowth of the uterus or its appendages may, by virtue of its size or position, so obstruct the venous circulation as to produce great venous engorgement. The presence of any tumor directly invites and keeps up a developmental attraction of blood.

Chronic valvular diseases of the heart, chronic interstitial changes in the liver, impede the portal, then the pelvic circulation; hence they are attended by uterine hyperæmia of a passive kind. Women who are subjects of diabetes are particularly prone to chronic uterine congestion.

Congestion and inflammation of the ovaries provoke augmented blood-accumulation in the uterus. Just as the initial physiological act of menstruation is commenced in the ovary, and thence propagated to the uterus, so certain morbid states of these organs lead ultimately to uterine congestion which may terminate in hemorrhage and enlargement.

Every act of coitus is followed by some acute fluxion of blood to the internal genitalia, which under normal restrictions soon passes away. But if the act is excessive and often repeated the vascular fulness becomes permanent and pathological.

Undue meddlesomeness of local treatment with the speculum or cauterization may perpetuate the very condition of chronic hyperæmia which it is intended to remove.

The condition of the pelvic circulation, especially in women, is modified in manifold ways by the general bodily condition. Imperfect general health, defective nutrition, and sluggish circulation in general imply low arterial tension and favor pelvic venous stasis. The female pelvis may thus be compared to a reservoir of great blood-capacity, the quantity of its contents being subject to remarkable fluctuations by virtue of various mental states, bodily conditions, and positions.

In conclusion, as chronic metritis takes its origin in hyperæmia from any cause, it may be stated that whatever conduces toward the accumulation and retardation in the uterine or utero-ovarian vessels leads directly to the different stages of the disease in question. The proximate cause in all cases is an excess of venous blood in the endometrium and parenchyma.

Frequency.—In view of the foregoing causative influences, predisposing and direct, it is not a matter of surprise that this is an affection of great frequency. Probably more than 50 per cent. of all women presenting themselves for local treatment show evidences of it in some degree. Its importance, then, cannot be over-estimated.

Varieties.—Chronic metritis—chronic hyperæmia and hyperplasia—may involve any portion of the uterus, neck or body, or certain portions thereof. For manifest reasons the neck of the uterus is the favorite habitat. The extreme liability of this portion of the organ to injury by contusion and laceration in parturition; to friction in coitus or by displacement; its dependency, favoring gravitation of blood within its structures; the relatively increased frequency of cervical endometritis over the kindred affection of the body,—these may be mentioned as among the more important reasons. Involution from some of these causes may be incomplete in the neck, while perfected in the body, of the uterus.

Hyperplasia may be localized largely within either wall of the neck or body. If in the former, it is generally the anterior lip which is affected; if in the latter, it is the posterior wall which is more frequently implicated, simulating fibroid infiltration. To the more frequent implantation of the placenta on the hinder wall and consequent increased risks of delayed involution, and to the fact that retroversion

is one of the most common forms of displacement after parturition, may be attributed this special localization.

Symptomatology.—There are no symptoms in chronic metritis pathognomonic of it, none that belong exclusively to it, none but what are found in other chronic pelvic (especially uterine) inflammations. Many of the symptoms are dependent largely upon the degree of hyperæmia, with the increased bulk and weight of the uterus. Others result from certain complications, such as chronic endometritis, almost constantly present. The most common local symptoms, which in a great proportion of cases date back to a confinement, are sensations of heaviness, weight, and dragging within the pelvis, aggravated by walking, standing, and the approach of menstruation. The performance of this last-named function necessarily augments the local blood-supply, increases the uterine weight, and consequently the tension upon the uterine ligaments.

Aside from these symptoms, resultant directly on excessive vascular fulness, there is pain, traceable to the structural changes going on in the parenchyma, leading to pressure upon the nerves. The uterus is hyperæsthetic. Pains radiate to the back, loins, limbs, and distant parts of the body.

Urination and defecation may now be made frequent and painful by direct pressure of the enlarged uterus upon the bladder and rectum, by congestion of these organs, or by a sympathetic irritation. Vesical irritability is sometimes one of the most annoying of all symptoms. Coccygodynia, usually a neurosis, is another sample of reflex uterine irritation. There is often dyspareunia. Leucorrhœa is, as a rule, present on account of coexisting endometritis. The menstrual function will be disturbed in time, duration, quantity, or quality according to the stage of the disease, the degree of hyperæmia, and the portion of the organ which is especially involved. At the beginning, when hyperæmia is the controlling pathological state, whether from subinvolution or otherwise, menstruation will be profuse, prolonged, or too frequent. Gradually, as hyperæmia diminishes, resultant on the growth of the connective tissue, the uterus becoming harder and denser, the menstrual flow will be less free until it is scant, or may after years become very irregular and cease altogether. A premature so-called "change of life" is thus brought about. A dull aching pain through the uterine region —congestive dysmenorrhœa—is often experienced, commencing a few days prior to the menstrual flow and increasing until it is well established. It is usually relieved by the depletion of the flow.

All of these local symptoms are aggravated by the occurrence of any serious amount of displacement. They are likewise more pronounced when the body of the uterus instead of its neck is the seat of the disease.

The reproductive functions are affected in various ways. Subinvolution and early chronic metritis appear rather to favor pregnancy, though abortions are more apt to follow. Each abortion adds to the original difficulty, leaving the uterus larger, heavier, and more vascular than before. Advanced stages of hyperplasia and sclerosis are attended with sterility. Pregnancy completed, parturition normal, a prolonged, careful attention during the lying-in state doubtless will do much to improve the morbid condition of the uterus previously existing.

The general symptoms have reference to the disorders of digestion, nutrition, and especially to disturbed functions of the nervous system. There is dyspepsia; the bowels are constipated; the body loses weight; there are feelings of languor and weakness. There are fretfulness, irritability of temper, melancholia, and sleeplessness. The various reflex or sympathetic disorders are more often manifest in chronic metritis than in any endometrial disease. Thus, the stomach is quite often made irritable in the form of nausea and vomiting. The mammary glands are enlarged, nodulated, and tender, especially preceding and during menstrual periods. The abdomen is flatulent, distended, and the seat of various irregular muscular actions. It is in this disease, after long continuance, more particularly approaching the climacteric period, that we more commonly witness the symptoms of pseudocyesis and phantom tumors. If prolonged into these years of climacteric change, all the nervous disorders so characteristic of this epoch are more early and strikingly displayed.

Hysterical symptoms are among the more important of the complications of the nervous system, and they are produced in every varying degree and form.

Headaches of the nervous and congestive varieties are the source of much suffering to many women. As the patient nears the menopause, and especially when the menstrual flux is becoming irregular and scant, the brain is prone to receive the impress of the undue vascular tension. Each period is preceded or accompanied by a flushed face, throbbing temples, and dull aching pain in the head.

Chloasma uterinum, a symptomatic pigmentation with brownish spots or patches distributed over the face, is most pronounced in brunettes and at the menstrual periods. These discolorations are not confined to this disease, inasmuch as they may be present as a result of various menstrual disturbances without any organic lesions.

Physical Signs and Diagnosis.—The uterus will be found to be enlarged, swollen, and sensitive. In the stage of subinvolution and hyperæmia these signs are apparent. The walls also are softer, flabby, and on inspection present the appearance of increased vascularity, usually of the passive variety. The enlargement is uniform.

In the second stage (hyperplasia) the uterine walls are still sensitive,

but hard, dense, enlarged, usually symmetrically, but maybe irregularly, in either wall of the neck or body. Irregularities in shape and nodulations from hyperplasia are mostly found where the parts are fissured from lacerations. Owing to increased bulk and weight the uterus is very often displaced downwardly, without, it may be, any change in its axis; posteriorly with almost equal frequency. The os is patulous, admitting the tip of the index finger. The sound shows increased measurement, 3 to 3½ or 4 inches, passes with great facility, and moves freely in the roomy upper cavity. This exploration detects the degree of sensitiveness, and is followed by a dull aching pain.

As hyperplasia may be localized to the cervix, corpus uteri, or be general, its exact seat is revealed by vaginal and rectal touch, specular, bimanual, and sound explorations.

Chronic metritis may be confounded with early pregnancy, small fibroid tumors, and scirrhus of the cervix.

Differentiation between chronic hyperæmia with hyperplasia and pregnancy is sometimes obscure, on account of the marked resemblance in many of the general symptoms and physical signs. In the former, however, menstruation very rarely ceases, though it may be irregular, and the uterus is very sensitive to touch.

If conception should take place in a uterus previously the seat of this disease while possibly the patient is under treatment, confusion is further increased. In all cases of doubt the use of the sound as a means of diagnosis, as well as all intra-uterine treatment, should be omitted, until at least further developments settle the diagnosis. If pregnancy exists, a few weeks will so alter the size, shape, and position of the uterus that the real condition generally becomes clearly revealed.

Likewise, fibroid tumors of small size, developing within either uterine wall or creating a symmetrical enlargement of the whole organ, present physical signs calculated to mislead. Conclusions may be based on the menstrual history and such signs as are elicited by touch, the use of tents, the sound, and conjoined manipulation.

Again, chronic hyperplasias with marked induration may offer suspicious evidences of cancerous infiltration of the infravaginal cervix. The importance of a correct diagnosis is very great, but this is at times very difficult. If the general health is declining and there is cachexia, the patient being advanced in years, and if there is menorrhagia, the evidence leans toward cancer. If the history points back to parturition, the local condition having been preceded by symptoms of chronic uterine inflammation, and there is a tendency toward amenorrhœa, the disease is probably not cancerous.

Spiegelberg has offered a method of diagnosis which certainly is valuable in the early stages of carcinoma, prior to destruction of any tissue in the mucous membrane. Thus—

1. The mucous membrane in a cancerous growth is firmly connected with the underlying induration, and immovable over it, which is not the case in mere hyperplastic thickening and induration.

2. The latter, under the pressure of compressed sponge in the cervical canal, becomes regularly (even though at times inconsiderably) looser, softer, and thinner; the cancerous infiltration remains unalterably hard and rigid, and cannot be stretched.

Localized hyperplasia of the anterior wall simulates anteflexion; of the posterior wall, retroflexion. The sound is the means of diagnosis.

Prognosis.—This is for the most part favorable, but is influenced to a great degree by the portion of the uterus, neck or body, which is affected, and also by our opportunity to remove the causative hyperæmia. Prognosis is much more favorable when the neck is the seat of the disease and the body is not implicated, for the reason that the symptoms are less grave, the disease is more easily attacked by local treatment, and, finally, the parts are much less sensitive to local interference.

If the cause cannot be removed, palliation alone is possible. Persistent hyperæmia produced by an incurable chronic cardiac or hepatic disease or pelvic tumor is susceptible only of amelioration.

Recovery is commonly tedious, and the patience of both practitioner and patient is sometimes severely taxed. It is not possible to directly remove or create any absorption of the proliferating connective tissue. The chronic congestion can generally be cured if its cause can be removed; always may it be diminished by local and constitutional measures. Its abatement may be the means toward an arrest of the hyperplastic changes.

The approach of the menopause is usually a favorable factor in prognosis, for at this time the vitality and vascularity of the generative organs gradually lessen.

The amount, kind, and degree of complications materially modify results. Coexistent displacements, chronic cellulitis, ovaritis, and cystitis present important and serious barriers to a successful issue.

May the morbid tissues of chronic metritis be transformed in cancerous formations? Noeggerath has reported several instances favoring this view. The experience of most gynecologists is to the contrary. Klob expresses himself thus: "What has been said by various authors on the relations of diffuse growth of connective tissue to the development of carcinoma must be considered a mere hypothesis." But these benign alterations in structure may, in such as are predisposed by the local irritation produced, indirectly conduce to the development of malignancy of growth. Particularly is this so when the hyperplastic formations are attendant on lacerations of the cervix.

The physician is often asked, What influence will pregnancy and parturition have on the local conditions of chronic metritis? In many instances, doubtless, the influence, if any, is injurious. Not only may the soft parts be torn in the delivery, but the subsequent involution may be made more imperfect. The uterus remaining larger, its supports are less adequate to perform their function, and the organ becomes further displaced. Such is by no means necessarily the case: pregnancy, parturition, and the lying-in state may be so conducted that an unusual opportunity is afforded to accomplish a degree of good which can be attained in no other manner. A natural delivery, with the integrity of the parts unimpaired; a prolonged decubitus free from sepsis; the administration of vaginal injections to secure perfect cleanliness; ergot and quinine to secure thorough tonic contractions of the uterus; the suckling of the infant; careful return to ordinary exertion, etc.,—are some of the means which may bring about a complete transformation.

As interstitial fibroid tumors, if not of too large proportions, have undergone absorption, since their structure is homologous to the uterine tissue proper, so, without question, there is reason to expect that hypertrophied cellular tissue from chronic metritis may likewise be caught into the processes of absorption in normal involution after parturition, and be thus removed.

Complications.—The most common complications are chronic endometritis, vaginitis, versions and flexions, pelvic cellulitis and peritonitis, and ovaritis. In point of frequency this is the order of occurrence. So frequently does chronic endometritis exist as a complication that it is seldom, if ever, entirely absent. In whatever way or form chronic metritis is developed, the starting-point of the disease is almost invariably in the endometrium.

Treatment.—It is evident at the start that a clear and correct understanding of the etiology and pathology of chronic metritis is of the utmost importance to comprehend the principles which underlie its management. How misguiding such terms as "irritable uterus," "chronic hypertrophy of the uterus," are is apparent. We must bear in mind that chronic metritis, so called—except in rare instances, after acute puerperal parenchymatous metritis—is not a chronic stage of an antecedent acute inflammation. We must also endeavor to detect which stage of the disease is present or predominant.

Treatment is both constitutional and local. As uterine congestion complicates or plays a most important rôle in a large proportion of all cases of chronic uterine disease, constituting the greatest and most serious obstacle to cure, it follows that the chief aim and object of treatment in this disease is to diminish and prevent the same. It may be laid down as a cardinal principle that there can be no permanent improvement until

the pelvic circulation is improved by a restoration of the tone of the blood-vessels. In various ways may this end be secured.

General Treatment.—Rest.—Such exercises as dancing, horseback riding, much carriage and street-car riding, ascending stairs, prolonged standing, the use of the sewing-machine, etc., which incite pelvic congestion, should be avoided. The patient should be instructed to lie down for a few hours in the middle of each day, the garments around the waist in the mean time being well loosened. The horizontal posture favors by gravity the partial emptying of the engorged blood-vessels and diminishes pain. The necessity for such periods of rest is most urgent as the menstrual epoch approaches and continues. Exacerbations of fluxion occur at these times; hence much can be done by judicious care in preventing relapses. But there is always danger that the strict enjoining of rest may lead to its abuse. Rest becomes injurious when unduly prolonged, as it interferes with digestion, circulation, and nutrition. A certain amount of exercise—walking in the open air—should therefore be carefully observed.

Not only rest by posture, but rest in its general sense, should be enforced. This implies freedom from excitement of all kinds, and the avoidance, if possible, of all causes of mental depression. Sexual intercourse is a frequent source of aggravation and perpetuation of uterine congestion. Nothing can operate more injuriously in maintaining local pain, interfering with the otherwise successful progress of a case, than frequent coition. If not entirely abstained from, it should be indulged in at long intervals only.

The beneficial effects of rest in its fullest sense—physical and mental—are at times well illustrated by a removal of the patient to, and a sojourn at, the seaside, the mountains, or some well-selected mineral springs. The change of air, diet, scenery, and associations, the presence of cheerful company, the absence of domestic care and anxiety, the freedom from coition, are powerful means in the restoration of the general health, and with it an improvement in the local conditions. The influence of such forces during a sojourn at mineral springs has more to do in restoring the health of many invalid women than the use of the waters by drinking or bathing. Not that, however, the mineral waters are to be ignored. Certain of them are most beneficial in improving the appetite, correcting indigestion, and promoting secretion and excretion. On the Continent the best are Kreuznach (iodobromated), Schwalbach, Marienbad, Carlsbad, Kissingen, Weisbaden, and Baden-Baden; in the United Sates, the Saratoga (N. Y.), White Sulphur (W. Va.), Blue Lick (Ky.), Hot and Warm Springs (Va.), and Rockbridge Alum Springs (Va.).

Weir Mitchell has introduced and practised a scientific system of enforced rest in conjunction with full diet, massage, and electricity.

The Mitchell plan of treatment is especially adapted to cases of confirmed neurasthenia and hysteria in its manifold forms dependent or not upon chronic uterine diseases.

Dress.—The garments should be worn loosely around the waist, and their weight should be as light as is consistent with warmth. Tight-fitting corsets and skirts, impeding as they do the abdominal circulation and depressing the abdominal and pelvic viscera, are to be discarded. All garments hanging from the waist should be suspended by appropriate apparatus from the shoulders. Instead of a corset, a light, well-fitted waist answers for this purpose. The use of an abdominal bandage, which will lift the abdominal viscera from below the umbilicus, diminishes intrapelvic pressure from above, and is not unfrequently a source of considerable comfort where the uterus is enlarged, heavy, and displaced downward or forward. High-heeled shoes, which distort the relations of the body, altering the natural inclination of the pelvis to the trunk, should be rejected.

Posture.—Posture influences in a most marked manner the pelvic circulation. As the blood-pressure is increased and venous stasis brought about by faulty position of the body in standing, sitting, and lying-down, these should be corrected.

Attention to the Bowels.—Especial attention should be directed toward acquiring a free alvine evacuation daily and the regulation of the functions of the chylopoietic viscera, as constipation and obstruction in the portal circulation always hinder circulation in the pelvic blood-vessels. The selection of the necessary medicine depends upon the condition and constitution of the individual. An occasional mercurial, followed by a saline purge, answers a good purpose in those sufficiently strong, when the tongue is furred, the portal circulation torpid, and there is constipation. The salines, sulphate of magnesia, Carlsbad salts, etc., in small quantities, well diluted, in the morning fasting, are well adapted to many cases. The various mineral waters, Kissingen, Marienbad, Hathorn, Congress, Hunyadi, are convenient agents for similar purposes of promoting secretions and giving freer intestinal movements.

Others are best suited by the vegetable laxatives, podophyllin, colocynth, aloes, etc., in small doses. Diet should not be neglected. Fuller directions for the relief of constipation will be given under the constitutional treatment of chronic uterine diseases.

Special Medication.—Certain medicinal remedies are known to influence the uterine circulation and diminish its vascular fulness. Notably among these stands ergot; inferior to it, but not unimportant remedies, are quinine, nux vomica, and the bromides. Ergot, in the form of the fluid extract, or ergotin should be administered three times daily in cases of subinvolution and in the stages of hyperæmia following; in fact, so long as increased vascularity remains the chief local pathologi-

cal factor of the disease. If the stomach becomes intolerant of its ingestion, suppositories per rectum may be substituted or the remedy may be given hypodermatically. Ergot tends to contract the fibres of the uterine wall, the unstriped fibres of the blood-vessels, and in this way diminishes congestion. Thus, its use is indicated during the menstrual period if there is menorrhagia, and during the interval for its more permanent effects on the affected structure. The virtues of ergotin are enhanced by a combination with quinine and nux vomica. A favorite pill with the author is—

R. Ergotinæ, ℈jss;
Quininæ sulphatis, ℈jss;
Extracti nucis vomicae, grs. viii.
M. Ft. mas. in pil. xxx. Div.

Sig. A pill three times a day.

When hyperplasia has well advanced ergot is useless.

The potassic and sodic bromides act with signal benefit in some menorrhagic conditions dependent upon uterine congestion. They are equally useful to control certain reflex disorders.

Some practitioners have praised the virtues of the mercuric bichloride and the auric and sodic chloride, given in minute doses, continued for a long time in chronic metritis. It is even claimed that they have the power to check and diminish hyperplastic infiltrations. Probably they are worthy of further trials in these directions. At any rate, the potassic iodide and the mercuric bichloride are valuable remedies at times in this disease prior to much hyperplastic change, remarkably improving the general health, although there is no specific constitutional taint. The mercuric bichloride, in minute doses long continued, often proves an excellent tonic, even increasing the number of red blood-corpuscles. When parametritic inflammatory exudations are present these remedies are especially indicated.

The prescribing of iron where there is early chronic metritis is a mistake too frequently made. All the chalybeate preparations promote pelvic congestion in either sex. The objections to their use are founded on experience. As a rule, iron is contraindicated; certainly it should rarely be given in the first stage and the first half of the second stage of the disease, although there is anæmia. Under its use the author has very often observed the menstrual periods made profuse, prolonged, and the local conditions aggravated. Toward the stage of atrophy or sclerosis with scant menstruation, iron is admissible if the general conditions indicate it.

Arsenicum (Fowler's solution), three drops, with water, after meals, is frequently beneficial when there are contraindications for the use of the chalybeate preparations. When the menstrual function is too frequent, too long, and too free, these disorders may sometimes be corrected by the persistent use of arsenic.

Local Treatment.—Increased local blood-supply to the uterus can be diminished by—

1. *Hot-water Vaginal Injections.*—In addition to keeping the parts clean, thereby preventing secondary vaginitis and vulvitis, vaginal injections of high temperature, used in large quantities, of long duration and with steady perseverance while the patient is in the dorsal position, are a means second to none to contract the dilated blood-vessels and improve the local circulation.

2. *Local Depletion.*—This can be practised by one of four methods—leeching, puncturing, scarification, and cupping. The first is through a cylindrical glass speculum large enough to engage the whole vaginal face of the cervix, which is first cleaned and then its canal plugged with cotton to prevent the entrance of the leeches within the uterine cavity. If the cervix is much vascular the necessary number of leeches (two to four) are pushed at once through the speculum against the cervix. On suspicion that blood will not flow freely the cervix should be punctured slightly before the leeches are placed in position. The leeches are permitted to remain until filled, the cervix sponged with warm water, and the speculum withdrawn. Leeching is expensive, troublesome, requires much time if well done, is distasteful to the patient, and the bites now and then bleed too freely and too long, and create much pain. In consequence this method of depletion has very properly been almost entirely superseded by puncturing and scarification.

Puncturing, if done thoroughly, will abstract all necessary quantities of blood quickly and conveniently. It is best practised by a spear-pointed instrument called Buttle's scarificator (Fig. 198). The point

FIG. 198.

Buttle's Spear-pointed Puncturing Instrument.

of this little instrument is thrust into the cervix at its most vascular points, care being taken not to wound a varicose vein. Each puncture should be from one-sixteenth to one-fourth inch or more in depth, according to the freedom of the flow of blood produced. The endeavor should be to deplete at each sitting to the amount of one to two fluid-ounces, each puncture depleting, on an average, one drachm. Bleeding is facilitated by sponging the surfaces with warm water. It generally quickly ceases, rarely continuing beyond the withdrawal of the speculum. The sitting can be repeated from once to twice each week, and may be extended over a period of several weeks or months, the indication being to continue until the cervix will no longer bleed freely. This little operation creates but slight pain, and may be practised

without the patient being acquainted with its nature, and at the physician's office.

Depletion from the interior of the cervical canal is best accomplished by scarification, done by a long, very narrow-bladed knife (Fig. 199).

Fig. 199.

Knife for Intra-uterine Scarification.

which on insertion to below the os internum is thrust into the mucous membrane to sufficient depth to sever the superficial blood-vessels, the incisions being extended downward over the rim of the os externum. The number of scarifications will vary from two to six. Both puncturing of the vaginal face of the cervix and scarification of the cervical canal may be done at the same sitting, the patient being directed to remain quiet for at least twenty-four hours.

Cupping increases the flow of blood after puncturing, but it is questionable whether the suction effect of this method does not draw blood from above into the uterus. The same objection may be urged against leeching.

As to the value of local depletion of the uterus, opinions are much divided. A decade ago it was much in vogue, now it has largely gone out of use. A great amount of this change in the methods of practice is due to the fashion of the abandonment of local bloodletting in all departments of medicine and surgery. It is still held in high repute, however, by French gynecologists. That local abstraction of blood accomplishes more than a mere temporary disengorgement of the loaded blood-vessels must be evident to any one who will judiciously and systematically follow the practice. The changed color for the better of the uterus, the diminution in its size and tenderness, the healing of erosions, the decrease in the discharge, the improvement in the local pain and reflex disturbances, in the quantity and duration of the menstrual disorders,—are the best evidences of its usefulness. Each abstraction of blood relieves distension by partially emptying the vessels. For a time the tone of the vessels is improved and the current within stimulated. A repetition of the practice, aided by other means, gradually enables the vessels to more permanently contract and recover themselves. Scarification not only empties the vessels, but a division of their walls with the knife is the application of an irritant, provoking contraction.

Another advantage of puncturing and scarification, besides the withdrawal of blood, is the rupturing and emptying of the numerous distended muciparous follicles studding the surface of the hyperplastic cervix, extending within the canal and imbedded within its walls.

Cystic degeneration is a constant source of irritation, maintaining hyperæmia. Puncturing of these retention-cysts rapidly relieves tension and reduces cervical engorgement. Its thorough and repeated application is the most important means in the entire destruction of their walls.

Local bloodlettings are therefore extremely valuable adjuncts in treatment. Indeed, they may be the keystone to the whole local management. But they are not equally well adapted to every case. These features of improvement (so far as the local abstraction of blood is concerned) can be obtained only in the early history of the disease. When induration from hyperplastic infiltration has commenced local depletion is useless.

The contraindications to puncturing and scarification are few. These are—tendencies to profuse hemorrhage from conditions of haemophilia; great varicosity of the parts; pregnancy; and finally, subacute and chronic perimetritic inflammation.

3. *Medicinal Applications.*—Among these glycerin ranks first. Pure anhydrous glycerin—a most active depletory agent on account of its strong affinity for the watery elements of the blood of the congested vessels—should always be selected. If there is coexistent cervical endometritis, with erosion, etc., the glycerin may be medicated with boric acid, tannin, etc. Such applications ought to be made every two to three days on absorbent cotton, so packed against and around the cervix as to freely drain it and to give support to the uterus if there is any displacement.

The persistent application of tampons wet with the glycerite of alum is most conspicuous for good in conditions of long-continued chronic congestion with or without displacement.

Iodine, in the compound tincture or a stronger tincture, is a most valuable alterative and stimulant applied to a congested, hyperplastic, and enlarged uterus. It will not take the place of direct depletion by the local abstraction of blood or of the tamponade with glycerin. Its special field of utility is after their use has ceased to be beneficial. Applications of the mild tincture may be made twice weekly; of the stronger tincture, about once weekly; carried to within the canal if there is cervical catarrh, painted over the whole vaginal vault if there are remaining indurations of old cellulitis or peritonitis, but always made to cover the whole infravaginal cervix.

Observation must have convinced most practitioners that chronic metritis associated with erosion and granular degeneration is not unfrequently more amenable to local treatment than where no such complications exist. The recognition of this fact has led some to make use of local irritants to produce similar conditions when they were not present. The effects of counter-irritation have been held in view.

Applications of a strong acetic vesicating collodion can be utilized for this purpose. The cervix having been engaged in a large cylindrical speculum, then dried with pledgets of absorbent cotton, is painted with this solution. The mucous membrane is thoroughly blistered; there is a free discharge of serum, perhaps pus, which flow depletes from the tissue above, also acts as a revulsive in the relief of pain and tenderness, as a blister does to an inflamed joint. Similar applications may be repeated from time to time according to the rapidity of the healing process and the effects obtained.

Upon the same principle much more active agents, the strongest caustics—acid nitrate of mercury, chloride of zinc, and caustic potash, the actual and thermo-cautery—have been brought into use. Setons through the cervix also have been employed. Fortunately, local treatment so severe is seldom indeed required. All possible therapeutic effects can be secured without these painful means and methods, and their use too often indicates mistaken notions of the pathology of the disease.

Medicinal injections of solutions of iodine, potassic iodide, ergotin, have been carried within the parenchyma of the cervix for subinvolution, chronic metritis, and other diseases. The results obtained at different times have for the most part not been satisfactory or devoid of danger. There is a possible future, however, for these parenchymatous injections in cervical cancer.

The use of sponge tents under proper circumstances—where the movements of patients can be controlled—to reduce the size of an enlarged uterus has been found to be attended with excellent success. Emmet, with whom the practice is original, speaks in the most satisfactory terms of them as exerting by pressure an alterative effect on the mucous membrane and indurated tissue, exciting the whole organ to contraction, and depleting from the circulation by the profuse watery discharge provoked.

Uterine massage was introduced into gynecological practice by Brandt of Sweden. Dr. A. Reeves Jackson of Chicago read an excellent paper on the subject before the American Gynecological Society in 1880, stating that he had obtained good results in three cases of subinvolution, areolar hyperplasia, with parametritic tenderness and fixation, after several months of treatment. Possibly, the method of treatment has a limited field of utility in a few cases of the above-mentioned diseases, but better results are obtainable by other methods less tedious and much less objectionable.

The question frequently arises in practice as to the advisability of the adjustment of a pessary in chronic metritis with an associated displacement. When tenderness has been diminished and local interference of an active kind is no longer required, the proper adjustment of

a well-fitting pessary with a broad bar, by supporting the uterus at a proper level and axis, will facilitate the return of the blood by the veins, relieve tension of the local circulation, and put a loaded organ at rest. If the displacement perpetuates a disordered circulation, it is certainly rational to counteract it, although it is secondary to metritic changes. The application of an abdominal bandage has likewise its place in certain cases.

Amputation of the cervix, when greatly hypertrophied from chronic hyperplasia, has frequently been performed. Since the days of trachelorraphy and the recognition of lacerations of the cervix and their results, the field for amputation has justly been greatly narrowed. The greatest hypertrophy may seemingly be present, when an apposition of the everted cervical lips will dispel the delusion. Proper repair and restoration of the cervix to position by Emmet's operation will lead to an effacement of the enlargement of the cervix, and with it to a structural improvement in the whole uterus.

Still, the question remains open: Is amputation ever desirable for conditions resulting from chronic metritis other than lacerations? The answer, it seems to the author, should be made in the affirmative. Removal of portions of the infravaginal cervix, it is well known, exercises a most wholesome influence, like unto the involution process on the tissues of the uterus above. The effect is similar to that noticeable in the tonsils after a superficial section has been removed. Atrophic changes follow. The experiences of several German gynecologists, Martin, Schroeder, Kehrer, and Olshausen, also of American authorities, Goodell, Noeggerath, Thomas, and many others, are favorable to it. The methods of amputation after Hegar, with circular exsection, the vaginal mucous membrane being stitched to the cervical, or that of Simon and Marckward, of flap amputation by wedge-shaped exsection of the lips separately, the divided parts being stitched together, deserve following. Some, however, prefer to leave the surface unstitched, to heal slowly through suppuration by granulations, believing that the secondary changes are better secured thereby. The class of cases suitable to these methods is those with enormous, intractable, otherwise incurable, cystic degeneration and great longitudinal hypertrophy, especially of the supravaginal portions of the cervix.

In conclusion, the practitioner is ever to be on the alert in searching for and treating complications which exist or may arise. Some of these, as laceration of the cervix and displacements, may have been prime factors in the induction of the disease; others, as fungosities of the endometrium, cystic and granular degeneration of the cervix, vaginitis, etc., are more often secondary. Any one of either class will aggravate and perpetuate the main affection. The relief of chronic metritis with bad cervical laceration is improbable, if not

impossible, save by tracheloplasty. Chronic hyperæmia may be continued indefinitely, so long as there is version or flexion which needs rectification. Fungosities of the uterine cavity provoke and repeat menstrual disturbances, thus becoming a local irritation to constantly invite vascular turgescence. Cystic degenerations keep the cervix enlarged, tender, and the seat of profuse discharges. Vaginitis is the source of an ever-present discomfort.

Remove the complications and the metritic congestion and hyperplasia are placed in a most favorable condition for amelioration if not cure.

When the third stage of the disease—sclerosis and atrophy—has been reached, local treatment is useless except for the complications. The uterus is hopelessly indurated and contracted. Very little can be done for an increase or a return of the menstrual flux. Attention to the general health is now the chief employment of the physician. The local use of electricity, especially intra-uterine galvanization, may possibly be of service.

Bibliography.

Barnes: *Diseases of Women.*

Boerner: *Ueber den Puerperalen Uterus,* Gray, 1875.

Courty: *Malad. de l' Utérus,* 1883.

Emmet: *Principles and Practice of Gynecology.*

Garrigues: "Rest after Delivery," *Amer. Journal Obstetrics,* vol. xiii. p. 845.

Hart and Barbour: *Manual of Gynæcology.*

Heschl: *Zeitschrift der Wiener Aerzte,* vol. viii., 1862.

Hodge: *Diseases of Women.*

Jacobi, Mary P.: "Chronic Metritis," *Am. Journ. Obstet.,* vol. xviii. p. 802.

Jackson: "Uterine Massage in Treatment of Certain Forms of Uterine Enlargement," *Transac. Am. Gynecolog. Soc.,* vol. v. p. 80.

Kehrer: "Transac. German Gynecolog. Soc.," *Amer. Journal Obstet.,* vol. xii. p. 189.

Klob: *Pathological Anatomy of the Female Sexual Organs.*

Martin: "Transac. German Gynecolog. Soc.," *Amer. Journal Obstetrics,* vol xii. p. 188.

Mundé, Paul F.: *Minor Surgical Gynecology,* 1885.

Noeggerath: "Chronic Metritis in Relation to Malignant Disease of Uterus," *American Journal Obstetrics,* vol. ii. pp. 505–610.

Scanzoni: *Diseases of Females.*

Schroeder: *Diseases of the Female Sexual Organs.*

Schucking: *Bullétin général de Thérapeutique,* Oct. 30, 1883.

Simpson: *Diseases of Women.*

Sinclair: "Measurements of the Uterine Cavity in Childbed," *Transac. Amer. Gynecolog. Soc.,* vol. iv. p. 231; vol. vi. p. 325.

Spiegelberg: "Diagnosis of the Early Stages of Carcinoma Uteri," *Archiv für Gynäkologie,* vol. iii. S. 2, 1872.

Thomas: *Diseases of Women.*

Van de Warker: "Use of the Seton in Chronic Affections of the Womb," *American Journal Obstet.,* vol. v. p. 226.

Constitutional Treatment of Chronic Uterine Inflammations.—The constitutional treatment of chronic endometritis and metritis in their different forms admits of but little variation, and its consideration has therefore until now been purposely postponed.

A general survey of the subject brings us to consider the especial adaptability of local and general treatment to each individual case. Each case must be studied by itself. Individual temperaments, idiosyncrasies, constitutional conditions and complications, the amount and kind of local disease, the degree of tolerance of local interference, etc., must receive attention.

A local disease which is but a local manifestation of a constitutional state especially requires constitutional treatment. Local diseases of purely local origin, as trauma, when of short duration and in good constitutions, need no constitutional treatment. Since, however, most cases which come under observation are suffering not only from a local disease, but also from depreciated general health—faulty nutrition, besides reflex disorders manifested in a multitude of symptoms—there is a call for both local and constitutional treatment. The reciprocal relations between constitutional conditions and local lesions are intimate, never ceasing, and cannot be disregarded. In fine, in a majority of cases encountered both plans of treatment are essential, a neglect of either being a fruitful source of failure.

As no absolute rule is applicable to all, a comparison of the relative values of constitutional and local treatment in chronic uterine diseases cannot fairly be made.

The first point to be gained in general management is, so far as possible, to remove the cause or causes producing or aggravating the local disease. Among these may be enumerated unnatural and unhealthful modes of life, as close confinement within-doors, want of proper exercise, faulty habits of dress, imperfect and insufficient food, prolonged lactation, and sexual excesses. It is generally easy to remove or modify these evils, provided sufficient interest on the part of the patient is enlisted. Numerous cases by way of illustration in the practice of most physicians can be called to mind. Witness, for instance, the rapid improvement from a course of treatment in some patients who at the same time live *absque marito;* the marked response to medication after weaning, following prolonged and excessive lactation; the quick return of color, weight, and strength after a change of diet, air, and exercise; the relief of pain, the abatement of leucorrhœa, by well-timed and judicious rest.

The general plan of management consists in the use of such means and measures, hygienic, medical, mental, and moral, as tend to remove disturbances of function, improve nutrition, and elevate the standard of the general health.

Rest.—With the body in the recumbent or horizontal position venous

distension of the pelvic organs is lessened and congestion is diminished. Rest, then, is beneficial in hyperæmic conditions of the uterus, and its advantages should always be made available. When there is much local tenderness and motions of the body are attended with pain, rest is doubly indicated. The presence of uterine hemorrhage and the menstrual period are also indications for rest. Prolonged rest in the recumbent posture, on account of the close confinement, the want of muscular exertion, the sluggish circulation, and the general enfeebling of the whole body which it entails, is ever, if possible, to be avoided. It is seldom, indeed, called for, except in perimetritic complications, and then only so long as exercise is painful. Prolonged confinement in its mental and moral aspects is equally prejudicial to the welfare of many patients by conducing to feelings of ennui, helplessness, irritability of temper, and melancholy. Its whole tendency is toward introspection, with a multiplication and exaggeration of symptoms purely subjective in character.

To every nervous impression such patients become unduly sensitive, and when, after long rest, the upright posture is assumed the quick distension of the much-weakened vessels, through gravitation of the column of blood, produces a degree of actual suffering in itself discouraging to many.

As Emmet well remarks, there never was a greater fallacy in practice than to place in bed a woman suffering with chronic uterine disease, under the expectation that she will recover by remaining there. While all the benefits of rest may constantly be taken advantage of by directing the patient to lie down for an hour or two each day, and to observe the same with more vigilance at the menstrual epochs, all of its disadvantages may be avoided by the observance of proper exercise.

Exercise.—Exercise promotes cutaneous exhalations, increases peripheral circulation, and equalizes the same, so often disturbed by local stasis within the pelvic viscera. By it the appetite is improved; the capacity for the digestion of greater quantities of food increased; the bowels are made more active, the muscles firmer; the body-weight is augmented; and sleep is favored. Therefore, as a rule, as much exercise in the open air, and in cold weather within the direct rays of the sun, should be taken as the strength and comfort of the patient will permit. Exercise which creates pain, especially if persistent, should be discontinued, but that which is followed by fatigue only, and which after a few hours' or a night's rest passes away, is to be encouraged. Of all the different methods of exercise, none is superior to walking, inasmuch as it secures the aforesaid results to the greatest degree. Attention to the manifold duties of domestic life give an occupation to both mind and body in many ways most desirable. The reaction on, and the depletion of, the general health from local pelvic diseases among women in the middle and lower ranks of life, *cæteris paribus*, are usually less,

because of a greater bodily activity among them. The pursuit of pleasure and travelling may afford most excellent opportunities for the observance of a necessary physical exercise. For manifest reasons carriage-riding should not supersede walking, and ought to be indulged in to the exclusion of the latter only by feeble persons. Horseback exercise is to be interdicted. Calisthenic exercises are often very valuable. The patient should be imbued with the idea that exercise is essential to health, and that, while it is possible to take but the smallest amount at first, it is to be gradually, day after day, increased; then, from a sense of duty, between proper periods of repose it is to be maintained in a free, regular, and systematic manner.

Bathing.—In the diseases under consideration the action of the cutaneous surfaces is generally defective; exhalations are often hindered and the peripheral circulation is inactive. A healthy action of the skin should be secured and maintained. This can best be obtained by appropriate bathing, friction, and exposure of the surface of the body to the light and the direct rays of the sun.

Bathing once or twice a week, simply for purposes of cleanliness, is usually insufficient. More frequent bathing (once daily), especially in warm weather, may be necessary. Warm and hot baths best augment the exhalative processes. Persons with weakly constitutions and feeble reactive powers are bettered by warm or tepid baths. The Turkish bath is most admirably adapted to those with torpid skins, cold extremities, and to rheumatic, gouty, and syphilitic constitutions.

Various mineral springs which possess thermal and medicinal qualities afford bathing properties frequently beneficial.

The cold bath (sponge or shower) is more tonic and exhilarant, and is suitable to the more vigorous. The addition of sea-salt to the water assists materially the remedial effects. Surf-bathing often proves to be most excellently tonic.

Whatever temperature or method of bathing is practised, there should follow immediately the most vigorous friction with coarse towelling over the whole surface of the body. The immediate effects may be somewhat fatiguing, but there ensues a rapid fluxion of blood to the periphery, and with it a degree of warmth of the body. The pelvic viscera are relieved, the appetite is sharpened, and all the reconstructive processes are quickened.

Light and sunshine are of almost equal value. The human system can no more thrive without these than can plants. The practice of taking sun-baths under proper precautions, to those who possess fit accommodations, is a good one.

Clothing.—The clothing should be light, easy, comfortable, and withal sufficient to protect the body during all seasons. The climate throughout much of the United States is exceedingly trying to many of feeble

health. The extremes of temperature are encountered and the changes are sudden and great. Underwear of flannel or other woollen material, or silk, covering the entire chest to the neck and the abdomen and the arms, is needed during the greater portions of the year in this latitude, and can be graded in weight according to the season. The corset, a source of so much injury to women by impeding the thoracic movements, weakening the imprisoned muscles, depressing the diaphragm, and through it the abdominal and pelvic viscera, thereby deranging their circulation, ought to be proscribed. To avoid, further, any depression of the pelvic organs all clothing ordinarily suspended around the waist should be supported in its entire weight (five to ten pounds) from the shoulders. The burden of extra skirts can easily be obviated by adopting thicker underwear. Cold feet and extremities, the source of pelvic discomfort and dysmenorrhœa, may be regulated by friction, exercise, and suitable woollen coverings.

Air.—The importance of open-air exercise and the exposure of the body to the light and the sun has already been suggested. Byford recommends a plan for invalids who in cold weather are unable to leave their rooms—viz. dress as for outdoors, and open freely all the windows and doors to flood the room with fresh, cool air.

Diet.—The administration of food is one of the most essential parts of the general treatment—to be successful requiring intelligent and faithful care. A large number of diseases, especially those of a chronic type, proceed from errors in diet as to the quantity, the quality, and the time of partaking of food. A healthy, vigorous physical constitution can no more be built up and maintained by improper and insufficient food than a steam-engine can be run on a defective supply of fuel—an analogy which Pavy has beautifully illustrated. The effects of an insufficiency of food are most apparent when the deficiency is abrupt and great—equally manifest, though longer developing, when the quantity for a long period of time is seemingly not much below the average required for normal nutrition. Denutrition may be a speedy or a very slow process. As a cause in the production of chronic diseases it is usually in the latter way. Digestion becomes difficult and otherwise disordered; there is constipation; the secretions are diminished. The blood is lessened in quantity, especially the red corpuscles; the watery element is increased; it loses its plasticity, and a tendency to hemorrhagic transudation arises. The subcutaneous fat disappears; the muscular tissues lose substance, becoming flabby; and with the decline in the assimilative process there is a fall in the bodily temperature. Functional activity in all the organs is impaired, the nervous system being seriously disordered.

Graily Hewitt has recently communicated some interesting facts showing that a continued insufficiency of food—a chronic starvation—

varying in degree, he had found almost constantly to exist in the chronic diseases of women coming under his observation. This quantitative deficiency had extended over a long period of time, commencing at puberty. He draws attention to the indirect effects of such insufficient alimentation—meat in particular—in producing vascular disorders of the uterus, chronic catarrhs, and alterations in structure and position. Chronic ulcers of the leg bespeak a poor regimen, and will not heal if the supply of food is defective in quality and insufficient in quantity. Why not, also, some of the degenerations of the cervix? "Pain," says Fothergill, "is hunger of the nerves for food." . . . . "Neuralgia is a prayer for healthy blood." The truth of these facts must be patent to every practitioner. Among no class or race of women are these deleterious influences more strikingly observed than in the American. With foods in quantities more abundant than elsewhere in the world, and in quality inferior to none, a slow, insidious process of starvation from false notions of diet has become a most potent factor in the causation of pelvic diseases in our American girls and women. On the other hand, a generous diet improves the hæmatosis, increases functional activity, augments the body-weight and heat, imparts tone and firmness to the blood-vessels and tissues, and diminishes the sensibility of the nervous system to pain and reflex irritation. A good diet is superior to medicine in the renewal of the body.

The diet of women suffering with chronic uterine disease should be plain, simple, easy of digestion, but highly nutritious and taken at regular intervals. It is necessary, therefore, that the attendant specify what articles of food are to be eaten, how much, and at what intervals. No inflexible rules can be laid down for all persons. The same foods do not agree equally with every one. Personal likes, idiosyncrasy, are to be consulted and in a measure used as a guide.

Of all the alimentary principles—nitrogenous, hydro-carbons, and carbo-hydrates—the first is the most valuable. Animal food ranks very high among the elements of nutrition. Meat, especially beef, of good quality and properly cooked (broiled and roasted), is ordinarily as easy of digestion as are fluid foods, and for a constant diet is easier. Its free use improves the quality of the blood, increasing the number of red corpuscles, and, as Liebig has shown, force in excess is developed. Fat is not increased, but muscular activity is promoted. It is claimed also that such diet diminishes the risk of the occurrence of phthisis, which, if true, is a fact of the greatest importance in this relation. Meat in some form—beef, lamb, or mutton, game, poultry, oysters and fish—should be taken freely, and, as a rule, some one of these three times a day. A too free or frequent use of soups is to be avoided: they are adjuncts to, but not substitutes for, solid foods. Milk and eggs are rich in nitrogenous matter. The former contains a considerable quan-

tity of fat; the latter possesses a maximum of nutrition in a minimum of bulk. Their use, save in exceptional cases where they disagree, is to be encouraged. A most excellent plan of dietary in cases of malnutrition embraces the ingestion of a half to a whole pint of fresh, pure milk from one to two hours after meals: if digestion is feeble, it may be taken peptonized. A cup of warm or hot concentrated beef-tea or beef peptonoids in solution may advantageously be substituted once a day for the milk. In conditions of marked feebleness of digestion the diet should be restricted to milk, pure or peptonized, and beef peptonoids, until the stomach can tolerate solid food.

Foods containing much starch and sugar—the carbo-hydrates—stand lower in the nutritive rank and lowest in the strength-giving qualities. Partaken of too freely to the exclusion of nitrogenous foods, they tend to indigestion, acidity, and flatulency. They have their place in our dietary, and for variety are needed. The cereals, vegetables, and fruits belong to this class. Bread, which stands first, possesses nutritive properties of the highest order. Wheaten bread should be prepared from the entire grain. Vegetables may be taken in moderation, not more than one to two at a single meal. The same holds true in reference to fruits.

The fats—the hydro-carbons—though not the exclusive, are active fat-, heat-, and strength-producing agents. Butter, cream, fats of meats, oils, etc., articles of this class, are most valuable elements of alimentation when there is malnutrition, lack of adipose tissue, spanæmia, etc. —conditions in which there is always an increased susceptibility to changes of temperature, to pain, and a diminished bodily resistance to disease. Pavy expresses it thus: "Fat accumulated within the vesicles and susceptible of reabsorption into the blood forms a store of force-producing material to be drawn upon as circumstances may require." Consistent with the ability to digest foods of this order, their use, under proper indications, may be urged. Cream with oatmeal, abundance of butter upon bread, and well-cooked meat-fats are selections which may be made with the object in view.

Coffee, if taken, should always be in moderation, not to exceed once daily (A. M.). On account of its tendency, with some persons, to derange digestion, and being a most active stimulant, it will be found well at times to discontinue it. Tea is less stimulant, and can generally be taken. Cocoa and chocolate make excellent substitutes.

The use of alcoholic stimulants demands the greatest caution. An invalid woman is even more prone than the sterner sex to contract habits of excessive alcoholic drinking. The grateful effects quickly expressed, the free relief to the sensations of languor and nervousness, soon pave the way to their too-frequent and too-free use. Very rarely ought alcohol to be prescribed under the plea of depression and exhaus-

tion. Wine or malt liquors, in moderation, taken with the more hearty meal, conduce to digestion, are quickly assimilated, and in selected cases become beneficial. To those who labor under feeble digestion, are anæmic, and of spare habit, and who can be trusted with their use, the aforesaid alcoholic beverages may occasionally be prescribed.

Certain articles of diet, as pies, cakes, most puddings, nuts, and candies, should be interdicted.

The great underlying principles of alimentation are, to select such foods as do not derange digestion, but improve it if disordered, and, above all, to introduce such quantities of the best nutriments as the digestive organs have capacity to incorporate.

The ingestion of foods at proper and regular intervals is of the next importance—a rule of equal value where there is anorexia. It will not do to wait for an appetite; in the mean time the patient may be starving. As is light to the eye, so is food the natural stimulant to the stomach. Appetite can be created by its judicious ingestion. In the foregoing plan and choice of diet the patient should be instructed and held until habit and taste are created.

Attention to Functions of Digestion.—In addition to a systematic regulation of the dietary the employment of certain medicines plays a most important rôle in aiding the functions of digestion. So frequently are these functions disordered that it is seldom they do not require some special attention, which, so far as medication is concerned, should be the first step in general treatment. Appetite is to be promoted and the various symptomatic disorders of the stomach are to be controlled. For the first, such stomachics as the vegetable bitters—nux vomica in tincture or its alkaloid strychnine; cinchona in tincture or elixir, or its chief alkaloid quinine; gentian, quassia, etc.—are the best. These act most favorably when administered before meals, and besides improving the appetite they give tone to the stomach, facilitating primary digestion. To further aid in the solution of the food the artificial digesters, pepsin, lacto-peptin, and muriatic acid, may be prescribed after meals. They are chiefly indicated where there are sensations of heaviness and weight after eating, attended or not with acidity and flatulency. The mineral acids, muriatic and nitro-muriatic, well diluted, frequently control acidity and flatulency better than the alkalies and more permanently.

In derangements of the secondary functions—imperfect digestion of the albuminoids, fats, and starches from some defect in the pancreatic secretions, etc.—pancreatic powder, some time after meals, may artificially be substituted. Ipecacuanha powder, in small doses (gr. $\frac{1}{4}$–$\frac{1}{2}$) after meals, is a remedy of no mean power in this direction, stimulating the flow of gastric juice and bile.

The efficaciousness of most of these remedies may be enhanced by various combinations. Thus:

℞. Strychninæ, gr. ss;
Acid. nitro-muriat. dilut., ʒij;
Aquæ destillatæ, ʒij. S. et M.
Sig. Ten drops, with water, before meals.

℞. Pepsinæ (Fairchild's), ℈j·
Pulv. ipecacuanhæ, grs. v;
Extract. gentianæ, ℈j. M.
Ft. in pil. xx.
Sig. One pill after each meal.

℞. Pepsinæ (Fairchild's), ℈j;
Quininæ sulphatis, ℈ij;
Strychninæ, gr. ss. M.
Ft. in pil. xx.
Sig. One pill after each meal.

The addition of extract pancreatis (grs. ij) to either of the above formulæ, or ext. pancreatis with sodium bicarbonate (each gr. iij), given alone after meals when this remedy is indicated, may be prescribed. The peptonizing of food, a process of partial digestion before stomach ingestion, first practically suggested by Wm. Roberts, F. R. S., of London, has much to recommend it. While its field of utility, *par excellence*, is intestinal indigestion, its use need not be thus limited. Many cases of malnutrition needing full feeding have feeble digestion. The artificial digestion of milk or beef so prepared is a great assistance.

For the symptoms of gastralgia no remedies act more promptly than bismuth subnitrate (grs. x) or Fowler's solution (gtt. j–ij) before meals.

A teacupful of hot water from a half hour to an hour before meals has been found to be an excellent means to improve the digestion in many cases of atonic dyspepsia and chronic gastric catarrh. The stomach is washed of adherent mucus, the blood-supply is temporarily increased, the secretion of gastric glands promoted, and the whole functional activity of the digestive organs facilitated.

The malt extracts, rich in diastase, assist the digestion of starchy foods, besides possessing in small bulk valuable restorative principles. They may be taken with or after meals.

Attention to the Functions of the Bowels.—There is no more common complication of chronic uterine diseases than constipation, none more serious, none which, for the want of proper attention thereto, is more calculated to retard a progress to recovery. Considering the frequency and the extent to which constipation exists in some women, it is no longer a matter of surprise that it is a most fertile source of pelvic disease. Not only does constipation impede venous flow within the rectum, favoring congestion and hemorrhoids, but it directly influences

in the same manner the venous circulation within the uterus and remaining pelvic viscera. The uterus is not only pressed upon or bent out of position by fecal accumulations within the colon and rectum, but by an increased vascularity it is rendered heavier. Its ligamentous attachments are stretched, relaxed, and weakened. Here are two factors alone conducive to displacements. Indirectly connected with the pelvic circulation is the portal, which in turn must be made sluggish. Appetite and digestion are now impaired.

It is a subject of wonder why blood-poisoning, from an absorption of the decomposing matter of large accumulations of feces long retained, does not oftener manifest itself. The absence of the more serious symptoms, which might attract attention, only demonstrates the capacity and endurance of the human system even under adverse circumstances. A slow, insidious, chronic toxæmia, escaping notice, is doubtless sometimes present. If the system suffers from bad drainage and defective sewerage without, why not within, the body? Excrementitious matter, long retained, must decompose and foul gases be generated; these, together with the liquid elements of the feces and products of waste tissue, become absorbed, vitiate the blood, irritate the nervous centres, and derange every function.

Free alvine evacuations can be secured daily by means hygienic and medicinal. Among the first are exercise, diet, drink, and regular habits. Bodily exercise, walking in particular, conduces to intestinal as well as other muscular vigor and strength. The sedentary habits of women furnish one of the principal reasons for the much greater frequency of constipation in their sex. Foods which contain a certain proportion of refuse material stimulate intestinal peristaltic action. Such foods are cracked wheat, coarse oatmeal, corn and Graham bread, and the succulent vegetables, fruits, and berries. The former are otherwise exceedingly valuable in view of their nutritive properties; the latter, while less nutritious, afford, on account of their different acids, a much-needed variety and promote gastric and intestinal secretions. If properly selected as to time of eating, quantity, and quality, they need not interfere with digestion. Coffee, and particularly green tea, in excess constipates. Water freely imbibed on an empty stomach—above all, in the morning fasting—favors intestinal action and liquefies the fecal accumulations. Its virtues are materially enhanced by the addition of a modicum of common table-salt. Congress, Hathorn, Blue Lick, and various sulpho-saline waters act similarly, are most effective, but should be regarded rather in the light of medication to be avoided if possible.

Constipation is a disease the cure of which can be obtained only by studying individual cases and causes. Mental attention directed to the bowels in endeavoring to obtain an alvine movement at regular, stated times is a matter of prime importance. Habit, albeit of slow develop-

ment, can be established in this regard with perfect regularity, failures largely resulting from a want of due patience and perseverance. A visitation to the water-closet at a certain hour (after breakfast), interrupted and prevented by naught else, be it friends, business, indisposition, or the weather, and there remaining for it may be half an hour, rarely fails after a few weeks to be successful. The posture should be easy, and no straining allowed. The simple concentration of the mind upon the present duty has its influence over the body. As a well-constructed water-closet is one of the most important parts of house-building, it should be accessible, convenient, comfortable, clean, and inviting. Goodell has drawn attention in a most graphic manner to the baneful influences of the old water-closet (privy) system in causing constipation.

Every effort should be made by the aforesaid means of diet, drinks, exercise, and regularity of habits, to obtain free and regular alvine movements before resorting to the use of any medication. Medicine is quite generally needed, but it ought always be borne in mind that it gradually loses its effect, and that the more taken the more will be required. Drugs stand in a subordinate rank to hygienic measures. The various laxatives and cathartics act by virtue either of promoting intestinal secretions or of exciting muscular peristalsis. Constipation presents conditions of defective secretion, in either the upper or the lower intestine, or paresis of the muscular fibres of the intestinal tube. Defective secretion in the upper intestine is evidenced by clay-colored, pasty, unhealthy-looking, offensive stools; in the lower intestine, by hard, dry, scybalous formations. Obstructions to the alvine passages are encountered within the pelvis on account of uterine enlargement and displacements —notably retroversion and flexion. Thus, the various indications for the use of the different remedies are obtained.

Defective secretion of the upper intestine calls for such remedies as mercurials, podophyllin, euonymin, leptandrin, iridin, ipecac, aloes, and rhubarb; of the lower intestines, the salines. Muscular inactivity of the intestines is met by nux vomica, belladonna, physostigma, aloes, and faradization. Two or more of these indications—defective secretion and muscular torpor—often present themselves. The practice adopted by Emmet and Byford, of commencing the treatment of those who have long suffered as chronic invalids by administering the mild chloride of mercury as a cholagogue, and occasionally repeating the same or mercury in the form of blue pill, followed by a saline as a cathartic, is doubtless very efficient in stimulating the portal circulation and secretions, dislodging fecal accumulations, and preparing the way for stomachic tonics. These remedies have also a revulsive effect on the congested pelvic viscera. This plan, although seemingly harsh, is not always contraindicated even in states of debility and anæmia.

When the tongue is furred, the alvine movements small, hard, dry,

and painful, the various mineral waters, taken in the morning fasting, are adapted. The following mixture of sulphate of magnesia and sulphuric acid with sulphate of iron, if indicated, answers well in many cases, being both laxative and tonic:

℞. Magnesiæ sulphatis, ℥j;
Acidi sulphurici diluti, ʒj;
Ferri sulphatis exsic., grs. xvj;
Aquæ destillat. ad ℥viij. M.

Sig. A tablespoonful or more in a wineglass of cold water before breakfast.

Or magnesia sulphate (ʒj–ʒij), dissolved in a tumblerful of water, to be taken each morning before breakfast, gradually diminishing the quantity of the medicine as habit is created, always, however, maintaining the original quantity of the water, may be prescribed. Carlsbad salts or sodium phosphate may be substituted for the magnesia sulphate.

The following formulæ will be found to meet many indications:

℞. Resinæ podophylli,
Ext. nucis vomicæ,
Ext. belladonnæ, *āā*, grs. ij.
M. Ft. in pil. xii.

Sig. One at bedtime if no movement during the day.

℞. Aloein, grs. iv;
Strychniæ, gr. $\frac{1}{3}$;
Ext. belladonnæ, grs. iij.
M. Ft. in pil. xx.

Sig. One at bedtime if necessary.

℞. Resinæ podophylli, grs. iv;
Pulv. ipecacuanhæ, grs. iv;
Ext. colocynth. comp., grs. xxiv;
Ext. nucis vomicæ, grs. iv;
Ext. belladonnæ, grs. iv.
M. Ft. in pil. xxiv.

Sig. One pill at bedtime.

The *Rhamnus Purshiana* (*Cascara sagrado*), in the form of the fluid extract (gtt. x–xxx), is quite usually an excellent laxative.

So soon as the proper dose of any laxative medicine has been determined, and the bowels by its aid have established regularity of evacuation, the dose should be gradually diminished until none is taken.

The colon, and especially the rectum, of women, after years of constipation generally have become greatly dilated and have lost all contracting power. Instead of a canal for the passage of fecal matter, they are transformed into an immense sac for its accumulation. The frequent administration of active resinoid cathartics only increases this difficulty

by leaving the parts in an increasingly weakened state. Manipulation of the abdominal walls by kneading, especial attention being given the whole track of the ascending, transverse, and descending colon, may be resorted to with advantage. Direct faradization of the abdomen and intestines (rectum included) may be useful. Both measures require to be persevered in for a lengthened period. The injection of cold salt water (about half a pint) within the rectum will not only empty it, but tends to excite muscular contraction. But the frequent and long-continued use of enemata is to be discouraged, as calculated to induce the condition referred to. The author has seen some excellent results after perineorraphy and colporraphy for constipation dependent upon relaxed vagina and rectum.

As a dernier ressort in some cases paralyzation of the sphincter ani by forcible dilatation may be tried.

General Medication.—The whole range of tonic medication becomes more or less useful in the treatment of the chronic uterine diseases with depreciations of the general health. For practical purposes, all tonic and restorative measures might be limited to the following: quinine nux vomica, iron, arsenic, phosphorus, cod-liver oil, electricity, and massage. Each of these deserves special mention.

Quinine, the chief alkaloid of cinchona, is the best representative of the whole list of bitter tonics. In moderate doses (grs. j–iij, ter die) it is a stomachic tonic, a general restorative tonic, promoting constructive metamorphosis and increasing mental and somatic activity. It is not a special uterine stimulant, but indirectly by its use such an influence may be exerted. These well-known effects of quinine enable the physician to utilize it in a large number of the chronic diseases of women.

Nux vomica, besides its field of usefulness in the atonic and nervous forms of dyspepsia and torpid states of the intestines, is employed in small doses for its stimulo-tonic effects, through the vaso-motor nerves and centres in the spinal cord, to contract the arterioles and muscular fibres, thereby increasing the arterial tension and improving the local circulation. Quinine and iron have their virtues as tonics increased by a combination with nux vomica or strychnia.

Iron is probably more frequently prescribed for the chronic diseases of women than any other remedy, and no other is capable of doing more good in properly selected cases. The common rules, that iron should not be given when the temperature is elevated, the pulse frequent in connection with increased temperature, the tongue furred and foul, the liver inactive, and the urine scanty and thick, are ever to be borne in mind. Local contraindications are equally important. Iron increases pelvic congestion in either sex, provokes pain when the uterus and ovaries are actively congested, and tends to excite menorrhagia. Much harm is often actually done in these conditions by saturating

patients with the preparations of iron. The digestive and alimentary disorders first need correcting, and the excretions should be made free before iron can properly be assimilated. The general indications are—anæmia, struma, syphilis, and some neuroses (neuralgias); the local—amenorrhœa, dysmenorrhœa, leucorrhœa, torpid and flabby states of the uterus, especially in anæmic subjects and the phlegmatic temperament.

Quinia and strychnia are often prescribed together as a tonic, and when there is no objection to iron all these agents may be combined, as—

℞. Pulv. ferri redacti, grs. xxx;
Quininæ sulphatis, ʒj;
Strychninæ, gr. ¾;
Ext. gentianæ, q. s.
M. Ft. in pil. xxx.
Sig. One pill after each meal.

The best preparations of iron are—iron per hydrogen, pill of the carbonate, sulphate, tincture of the muriate, syrup of the iodide (Creuse's formula), and the pyrophosphate.

Blaud's pill of the carbonate of iron (grs. ij–iij, ter die) has had a deservedly high reputation for anæmic, chlorotic, and amenorrhœic females. No preparation of iron is so efficacious to rapidly furnish the needed material to the blood as the muriated tincture. In those exceptionally rare cases where uterine hemorrhage is prolonged by extremely watery conditions of the blood, lacking all power of spontaneous hæmostasis, this preparation of iron is very serviceable. Creuse's syrup of the iodide is well adapted for strumous, syphilitic, and tubercular cases. A light, agreeable, and efficacious preparation of iron, which does not constipate the bowels, is the pyrophosphate. The following is a favorite formula:

℞. Ferri pyrophosphatis, ʒj;
Acidi phosphorici diluti, ʒij;
Syrupi simplicis, ʒxiv.
Sig. A half teaspoonful or more three times a day.

The officinal elixir ferri, quininæ, et strychniæ phosphatis, now made by the best pharmacists, often produces effects most conspicuous for good. As a rule, all preparations of iron are best omitted during menstruation.

Arsenic checks retrograde metamorphosis and improves nutrition. It is a good remedy, given in minute doses (gtt. j–ij) before meals, in irritative dyspepsia, and rather aids than otherwise movements of the bowels in chronic constipation. In addition, it has an excellent adaptation to certain gynecological affections, being indicated in a class of diseases in which iron is highly objectionable. Chronic uterine leucorrhœa, cervical or corporeal, and menorrhagia dependent upon chronic hyperæmia and endometrial fungosities, are often much benefited by

arsenic. Next to ergot and quinine, arsenic stands as a remedy for the so-called chronic metritis. It should be given in small doses (gtt. iij–v) after meals for a long time.

Phosphorus, in the form of the phosphates, is a very important element in the nutritive processes. Eligible preparations are the officinal syrup. hypophosphite comp., syrup. calcis lacto-phosphite, etc. Either one of these preparations may be given where there is defective activity of the nutritive functions, as in anæmia, malnutrition, morbid wakefulness, and melancholia the result of cerebral anæmia and exhaustion, in neuralgia, spinal irritation, migraine, etc. The phosphide of zinc (gr. $\frac{1}{10}$, ter die) is one of the best preparations to secure the influence of pure phosphorus. All preparations of phosphorus tend to increase the menstrual flux.

Cod-liver oil, on account of its power under proper circumstances to facilitate gastric digestion, promoting the appetite, and, above all other fats, forming the molecular basis of the chyle, is admirably adapted to meet many of the morbid constitutional states found in women with chronic pelvic disease. So soon as the stomach and bowels have been regulated by a proper diet and medication, cod-liver oil should be given where there are anæmia, certain diatheses and cachexiæ, the body-weight below the normal standard, and the nutrition below par. Anstie and Radcliffe have clearly pointed out that a diet of fats, especially cod-liver oil, has a high degree of efficacy in many neurotic affections. Through its influence in improving the general health it is very deservedly highly prized in chronic uterine diseases. A combination of the hypophosphites of lime and sodium with cod-liver oil will meet numerous indications. Further to increase the assimilation of fats, cod-liver or olive oil or cocoa cream may be introduced into the body by inunction after a warm bath at bedtime or after general massage. From one to two ounces daily may be incorporated in this way. Such treatments soon begin to show their effects in increased weight and improved appearance.

Electricity,[1] in the form of both the faradic and the galvanic currents, is very often utilized for chronic uterine diseases. A marked physiological effect of electricity is to promote and increase the menstrual flux, irrespective of whether it is applied locally or generally. It is therefore doubtless to be withheld in some conditions of menorrhagia, while indicated in the amenorrhœic. Galvanization of the central sympathetic, the cord, or the pelvic regions will at times very favorably affect dysmenorrhœa of the neurotic type.

Systemic massage has been proven to be one of the best tonics. It consists in a systematic exercise, by friction, kneading, tapping, and passive motion, of all the muscles, of both the extremities and the

[1] See article on "Electricity."

trunk, from half an hour to an hour, once to twice daily. First the excitation of the cutaneous circulation is followed by a general rise of temperature; the muscles are brought into most active exercise without the expenditure of nerve-force; then there is an acceleration in all the organic functions and a gradual increase of weight. A most marked improvement in the various morbid phenomena of the nervous system follows. Local tenderness and pains disappear; a pleasant sense of exhaustion, and with it a refreshing sleep, is manifest. Faradization and massage combined form the two most valuable means of exercising the muscles. The good effects of exercise are obtained with exertion. Successful results with massage or massage and electricity require the employment of a trained rubber—a *masseuse*.

S. Weir Mitchell of Philadelphia has obtained some surprisingly good results from general massage, conjoined with exclusion, rest, diet, and electricity. Each of these has been utilized by others, but to Mitchell is due the credit of first scientifically combining these different means into one common therapeutic system of treatment. W. S. Playfair of London has also published accounts of some cases equally wonderful, and many other physicians, instructed by Mitchell's teachings, have been able to confirm his results.

The typical cases most likely to be benefited by massage are those of long standing, who are bedridden, wasted, hysterical, with a variety of simulated disorders. Such patients have probably dragged out for years a miserable existence in chronic invalidism. In many, though by no means all, as some might suppose, there is some local disease, and from this starting-point the invalidism commenced; but the resulting general disturbance has at last become so great as to completely overshadow the local. Every endeavor at an amelioration by further local treatment or general medication is utterly useless. Playfair has well remarked that the worse the case is, the more easy and certain it is of cure by the Mitchell plan of treatment.

There are, however, not a few cases of neurasthenia, debility, and wasting in women, consequent on some chronic uterine ailment, not confined to bed or the house, which may be much benefited by massage or massage with electricity and a full diet, but with partial rest and without seclusion. The different features of this plan of treatment may be varied to suit individual cases. In addition, those who are fat, with flabby muscles, sluggish circulation, are improved by massage.

The successful use of massage requires skill, otherwise it may be hurtful. It is the principle of the rest-cure which should be aimed at in all cases; the details are applied with many modifications. The execution of these details to obtain successful results implies infinite tact, great patience and perseverance, and gentleness combined with firmness.

A course of massage, electricity, and rest should always be followed up by a well-regulated regimen, dietary, and exercise. Special symptoms seldom require special attention. The general and local treatment is addressed to the underlying morbid states and the faulty habits producing these symptoms. When the former are corrected the latter, in turn, abate. The temptation is always strong, and the physician is too often persuaded, to resort to the various anodynes to arrest pain. The excessively frequent practice of the administration of opiates—morphia hypodermatically in particular—because there is pain, without an investigation of its cause, is one of the crying evils of medical practice of to-day. Except for acute pain due to inflammatory action or after a surgical operation opiates are really seldom needed. They are dangerous remedies for the chronic uterine diseases, and their use, once commenced, soon begets a subjective erethism and neuralgia as difficult to overcome as the original affection. Every discomfort is dwelt upon and magnified; the drug-intoxication is the only solace. But difficult as it is to resist the imperious cravings, dependence upon these drugs must be broken up, otherwise the case is hopeless.

Almost equally pernicious is the habit of prescribing opiates, chloral, and the bromides to produce sleep. The last named are the least objectionable, but their use should never be depended upon for any lengthened period. The bromides are vaso-constrictors and depressors of reflex action; hence they prove to be our most reliable remedies for the reflex neuroses, psychical or physical. Sleep, of which an abundance (eight to nine hours) is daily needed, should be obtained by regular habits, proper food, plentiful amount of exercise, massage, electricity, a cool and well-ventilated room, and self-control.

General nervousness or nervous excitability is gradually controlled by a removal of the cause, proper hygienic measures, and such tonic medication as the special indications call for. The use of the stronger alcoholic stimulants under these circumstances is greatly to be deplored. Save the lighter wines or malt liquors, and these only with food (the heavier meal), and under conditions to which attention has been directed, all alcoholic stimulants ought to be interdicted, for they, like the opiates, are unsafe agents in the hands of invalids.

Headaches of the neurotic type are best treated by quinine, strychnia, arsenic, phosphide of zinc, cannabis indica, and iron during the interval, and by caffeine, the bromides, and galvanization in the attack; those of the congestive form, by the bromides, belladonna, etc.

Many of these suggestions in general management may seem commonplace and unnecessary, but to one who has had much personal contact with such diseases in their manifold forms there is nothing in the least promising which should be deemed unworthy of trial. The patient must manifest an intelligent co-operation. The utmost regularity in all

habits and faithfulness in the observance of all directions are requisite. Every detail is important, and he who gives most heed to each is the one who, other things being equal, meets with the most prompt and best success. Chronic diseases require a chronic treatment. There can be no restoration of the local so long as the general health is deranged. The reciprocal relations between the two are so strong and intimate that a permanent improvement in the one can only be coextensive with the other.

In no class of diseases is it more incumbent upon the physician to bring to bear the influences of a moral treatment. His own manner should be cheerful, hopeful, and inspiring. A personal magnetism counts in no small degree in creating a confidence so necessary to enlist the proper interest and intelligent co-operation of one long sick. To divert the invalid's mind from herself and her condition, to direct her thoughts into new channels, to enable her to exercise the most healthful discipline of self-control, is by no means ever an easy task, but when well done may accomplish more than medication in restoring lost health.

So extended is the sphere of the application of remedial agents in the constitutional management of the diseases under consideration that a thorough knowledge of the whole field of medicine embraced is requisite. To survey the system at large, to recognize the true import and significance of special symptoms, to detect disease in kind and degree wherever found, must needs be the office of the gynecologist. No class of affections, the body over, possess so many ramifications, assume so many phases, induce such general disturbances as do the chronic diseases of the female pelvic viscera. Therefore no one can be a competent and successful gynecologist who is not first a thorough physician.

Bibliography.

Anstie: *Neuralgia, and the Diseases that Resemble it*, 1871.

Beard and Rockwell: *Treatise on Electricity*, 1883.

Byford: *Diseases of Women*, p. 288.

Emmet: *Diseases of Women*.

Fothergill: *Indigestion and Biliousness*.

Goodell: "Lessons in Gynecology" and "Neurasthenia and Womb Diseases." *Am. Gynecolog. Soc. Transac.*, vol. iii.

Hewitt, Graily: "Chronic Starvation and Delicate Females," *Clin. Lancet*, Oct. 6, 1883.

Mitchell, S. Weir: *Fat and Blood*, 1884.

Pavy: *On Food and Dietetics*.

Playfair: *Nerve-Prostration and Hysteria*.

Roberts, William: *Lumleian Lectures*.

SUBINVOLUTION OF THE UTERUS AND VAGINA.

By THADDEUS A. REAMY, A. M., M. D.,

Cincinnati, O.

Subinvolution of the Uterus.

Nomenclature.—Much confusion has existed, and still exists, regarding the relations of this affection and chronic metritis, and the nomenclature is faulty.

Some authorities believe in subinvolution as an entirely distinct affection, while others believe it to be only the first step in chronic metritis. Consequently, this latter class when treating of chronic metritis really include what the former treat as a separate pathological condition. While no name has been so universally applied to defective reduction of the uterus after parturition as "subinvolution," the condition has received many other designations from the various writers upon the subject.

In Sir James Simpson's article on "Morbid Deficiency in the Involution of the Uterus after Delivery,"[1] read in 1852, he makes use of the term "subinvolution" in naming the condition of morbid deficiency, which was probably the first time the term was used. In a previous paper on the subject[2] he first called attention to such a condition, naming it "morbid permanence of the state of puerperal hypertrophy."

Klob, after a study of the pathological changes and conditions found in the uterus which has not undergone perfect involution, in an endeavor to more accurately describe both cause and condition calls it "habitual hyperæmia with profuse proliferation of connective tissue."[3]

Scanzoni, holding the views of Sir James Simpson and many early writers on the subject respecting the inflammatory cause of the disease, styles it "chronic parenchymatous metritis."[4]

Most authors among the French believe the condition one of inflammation, and have generally employed the same designation.

Edis[5] uses many of the terms employed by previous authors, and

[1] *Selected Obstet. and Gyn. Works*, 1871.

[2] *London and Edinburgh Medical Journal*, Nov., 1843.

[3] *Path. Anat. of Female Sexual Organs*, 1868, pp. 127 *et seq.*

[4] *Diseases of Females*, pp. 175 *et seq.*, 1881.

[5] *Diseases of Women*, p. 176, H. C. Lea's Son & Co., Phila., 1882.

treats the affection under the term "chronic metritis," although disclaiming any belief in its inflammatory nature or origin.

Thomas[1] so firmly disbelieves in inflammation as a cause of the disease that he objects to any term which conveys the idea that it is in any way inflammatory, and invents the term "areolar hyperplasia" as most descriptive of the conditions marking the uterus in defective reduction.

Hodge designates the condition "irritable uterus," from its clinical aspects.

Lisfranc calls it "engorgement," to describe at least one step in its etiology.

Kiwisch[2] uses "infarctus" as his designation, to show the vascular condition when involution is imperfect.

Noeggerath, while a disbeliever in its correspondence to inflammation, thinks it should be called "diffuse interstitial metritis."

Hart and Barbour,[3] after quoting much of the above nomenclature, although at the same time not believing it an inflammation in any sense, adopt the old term "chronic metritis," assigning as their reason for so doing that "we are not yet in a position to propose a term resting on a sure pathological basis."

Mary Putnam Jacobi,[4] who has written a very able and exhaustive paper on the subject, calls this affection subinvolution, and makes both a clinical and pathological distinction between it and chronic metritis. The recognition of such a distinction, which is rationally sustained, will probably prove a basis for enlightenment upon a subject hitherto obscure.

History.—The history of subinvolution of the uterus—or, properly, its existence as a distinct affection treated in medical literature—is comprised in a little more than four decades. As a disease it has certainly existed as long as the uterus itself, but, like many other diseases, its recognition as a separate affection dates but a few years back. While there are a few indistinct and general allusions to an enlarged condition of the uterus remaining after delivery by others, it is to Sir James Simpson that we are indebted for the first accurate and well-defined information on the subject. It is an interesting fact that this distinguished observer almost immediately after he devised his uterine sound, and probably through this additional means of investigation and diagnosis, discovered the symmetrical hypertrophy of the uterus which is so familiar to the profession to-day.

His first description of his sound—or uterine bougie, as he called it

[1] *Diseases of Women*, pp. 307 *et seq.*, H. C. Lea's Son & Co., Phila., 1880.

[2] *Klinische Vortr.*, Prag, 1845, p. 104.

[3] *Manual of Gynæcology*, pp. 306 *et seq.*, 1883.

[4] *Amer. Journ. Obstet.*, Aug., 1885.

—appeared in the August number of the *London and Edinburgh Monthly Journal* of 1843. In the November number of that *Journal* for the same year is a paper from his pen in which he first calls attention to subinvolution under the title "The Morbid Permanence of the State of Puerperal Hypertrophy." In the above-mentioned article he modestly asserts himself as the first investigator in this field in the following words: "This peculiar condition does not appear to have as yet attracted the attention of obstetric pathologists as the cause of one of those forms of chronic hypogastric tumors that are occasionally met with during the first weeks and months after delivery." Then, as an apology for his predecessors in the field of gynecology not having been able to recognize and describe so patent a disease, he continues: "The want of any decisive means of recognizing it has doubtless led to this omission." The decisive means here referred to was the sound of his own device, to which he ascribes the honor of discovering the character of these so-called "chronic hypogastric tumors," which were so frequently noticed, and whose mysterious disappearance was either a puzzle to gynecologists or attributed to the various remedies which were administered for their cure. However, there are few gynecologists at the present day who would invoke the aid of the uterine sound in diagnosis of this condition.

Immediately after the publication of the article mentioned many observers began to investigate the subject, but, so far as can be ascertained, nothing new was offered, and the disease was simply accepted as a morbid permanence of puerperal hypertrophy.

In 1851, Dr. Snow Beck described, microscopically, the same condition in a paper read before the Medical Society of London, April 12, 1851, but made no reference to Simpson's discovery in 1843. He simply called it "a new disease of the uterus." His paper contained an account of the microscopic examination of a uterus from a woman who had died a considerable time after delivery, which was found post-mortem to be greatly enlarged. He says the uterine tissue did not appear to the microscope to contain any inflammatory or abnormal deposit. The muscular tissue appeared to hold a medium position between that of the impregnated uterus and the muscular tissue of the gravid organ. He concludes as follows: "These facts pointed to the conclusion that this affection had its origin in an arrest of the due absorption which naturally follows parturition." These conclusions may be said to be the same reached, as to the etiology of the affection, by Simpson and most subsequent observers up to the time of Dr. Beck's paper.[1] Indeed, the reduction of the uterus after delivery was ascribed to fatty degen-

[1] Since the woman from whom this uterus was obtained died of typhus fever, and since the microscopic details are very incomplete, it is doubtful whether the case throws any light upon the subject of subinvolution.

eration before Simpson's discovery, and the general belief, that the disease was due to a deficient absorption, was quite natural.

Dr. Lever[1] refers to cases of defective involution as a "morbid permanence of the state of puerperal hypertrophy," and quotes as his authority Sir James Simpson's paper of the preceding year.

Simpson, in a note appended to a later edition of the paper referred to, says: "Long after the above was written I met the following passage in Dr. Hooper's work, which showed that the diseased state I had noticed during life was known to him as a post-mortem appearance: 'When a fœtus has been recently expelled, it is, in some instances, a long time before the uterus returns to its original state, and it is larger and softer during the period. I have examined uteri four times their natural size from this cause two months and even more after the fœtus was expelled.'"[2] He also, in a note appended to the same article, asks the following question: "Is this disease alluded to in Kleinert's *Repertorium*, Band ii., 1838, S. 51, as described by Kopp under the name of hysteranesis in the first volume of *Denkwurdigkeiten*, p. 168? I regret to say I have no access to this work." Thus it seems that Simpson himself would endeavor to disclaim his right to priority in the description of the disease, but to us there can appear little doubt that the honor of discovery belongs to him; at least he was first to describe the condition in the living subject. He described and laid down rules for the treatment which have been very little modified in forty years.

Dr. Fleetwood Churchill,[3] who wrote on the diseases of women before Simpson's time, describes, as do most other gynecic authors of his and former times, an inflammation of the uterus. He probably is describing what Simpson observed and named subinvolution when, in recounting the terminations which inflammation of the uterus may undergo, he says: "Hypertrophy or induration, which appears to consist either in a temporary enlargement, probably from afflux of fluids, or in a permanent augmentation of the tissues of the womb itself, which may thus be vastly increased in size." He describes further the appearance of such a uterus as follows: "If a section be made, the texture will be more or less fine according as the induration is temporary or permanent, and of a reddish or grayish color, the surface being smooth and uniform." From this I think we are without doubt to infer that he had under observation the condition of subinvolution, but he nowhere assigns a defective reduction of the uterus as a cause; neither, indeed, do I find any evidence that he understood in any way the process of uterine reduction.

Still earlier than Churchill, and quoted by him, Dr. Burns[4] recorded

[1] *Guy's Hospital Reports*, vol. ii. p. 18, 1844.
[2] *Morbid Anatomy of the Human Uterus*, p. 5.
[3] *Diseases of Females*, 1844.
[4] Quoted by Churchill, *op. cit.*

under the title *ramollissement* a condition of the uterus which must have been subinvolution. The following are his words: "Sometimes as a consequence of uterine inflammation more or less distinctly marked, but occasionally without any very distinct indication of uterine disease, we find part or the whole of the womb softened and its substance very easily torn."

Duparcque[1] has observed a condition of things described as follows: "The autopsy of females who have died of metritis shows the tissue of the uterus swollen, reddish-black, softened, friable; the blood with which it is engorged is mixed with a puriform or serous fluid." It is probable that these were cases of defective involution of the uterus.

It seems, however, that none of the observers up to Sir James Simpson made out the cause of certain enlarged uteri which they saw. Although in England this disease has been recognized as distinct from what has usually been called "puerperal metritis" by continental writers, with the exception of Courty,[2] yet it seems to differ from the chronic parenchymatous metritis of Scanzoni[3] and the post-puerperal metritis of Chomel only in etiology. Most authorities have treated the enlarged condition of the uterus found some time after parturition as subinvolution or chronic metritis, and whichever view they have supported has been advanced to the exclusion of the other. Some have held that the chronic metritis which they sustain is almost if not entirely identical with defective involution. Others maintain that there is a morbid process engrafted upon and due to the pre-existing subinvolution which they call chronic metritis.

Mary Putnam Jacobi is not an exclusive partisan of either view, but an advocate of both. She claims that subinvolution and chronic metritis both exist and are capable of clinical differentiation, and are the results of markedly diverse pathological processes.

Thus it is seen that owing to the confusion of terms and the absence of unanimity on the part of those who have been considered authority regarding the relations of these affections, clear conception has not generally been reached. It is not improbable that more accurate knowledge, and therefore better agreement of opinion, await us in the near future.

From all that has been written upon the subject, probably the correct inference is that there is an enlarged condition of the uterus remaining after parturition as a result of defective retrogression, which has not usually been differentiated, either clinically or microscopically, from enlargement due to some morbid process subsequently added to this defective involution. Since this condition of enlargement arises from

[1] Quoted by Churchill, *op. cit.*

[2] *Diseases of Uterus*, pp. 594 *et seq.*: "Ovaries and Fallopian Tubes," 1883.

[3] *Op cit.*

causes so dissimilar in character, it is fair to presume that there are differences in the conditions which have as yet escaped observation, and there seems to be thus good ground for assigning different names to the condition based on its etiology. For instance, it is proper to call that enlargement due to defective reduction subinvolution, while it would be certainly irrational to call such a condition due to other cause by the same name, even though we were unable to make any other than an etiological distinction. But since the possibility of a clinical distinction appears to be demonstrated, it would be wise to confine the term subinvolution to defective reduction pure and simple, and to employ some other term for this superadded pathological process; and we cannot at present do better than to call this state chronic metritis, not retaining the phrase simply in conformity to fashion, but because we believe the condition to be one of chronic inflammation.

Histology.—In order to a better understanding of the pathology of the changes in the uterus in both normal and abnormal involution, a brief study of the histology of the organ is necessary.

While the main points in the histology of the uterus are agreed upon by authors, some of the minuter structure is still *sub judice*. As a whole, the uterine walls may be said to contain five distinct classes of elements:

1. Unstriped muscle-fibres of the highest order and in the highest state of development. These cells vary in length from $\frac{1}{110}$th of an inch in the unimpregnated uterus to $\frac{1}{10}$th in the gravid state. They are for the most part closely interlaced with each other, and are arranged in bundles or layers, united and at the same time separated by areolar tissue. This areolar type of connective tissue is more abundant at the outer part of the muscular walls. The muscular structure of the uterus may be divided into three layers with reference to arrangement:

a. The outer of these is a thin stratum lying immediately beneath the serous covering of the organ. The bundles of this layer are said to arch across the fundus in a longitudinal direction, beginning at the cervix, some passing into the broad and others into the round ligaments.

b. Internal to this is found another thin stratum of muscular tissue, which is in the posterior wall, from which its fibres run over the fundus and sides of the organ, and ramify among the blood-vessels, which are here most numerous. It is also in this portion that the nerve-structures are most plentiful.

c. The innermost layer of muscle is probably the part of the uterine mucous membrane which corresponds to the muscularis mucosæ of other hollow organs. It is much thicker than the other layers, making the greater part of the uterine wall. The muscular portion of this muscularis mucosæ is so well marked as to make it distinctly different from that portion of other mucous membranes, and to class it properly as a

portion of the muscular wall. Its fibres are peculiarly arranged as two sphincters surrounding the entrance of the Fallopian tubes, whose most external fibres interlace with each other at the anterior and posterior of the fundus, while they change direction at the cervix in such a manner as to run almost transversely, forming sphincters at the os internum and os externum.

2. Homogeneous or amorphous connective tissue, which forms the areolar tissue of the muscular part of the walls, being found also in the mucous membrane.

3. Fibrillar connective tissue, which assists in forming the sustentaculum of the lymphatics, according to Leopold.[1]

4. Round, spindle-shaped, and irregular cells imbedded in the homogeneous tissue, which, according to Thomas, are supposed to be elementary fusiform fibre-cells.

5. Yellow elastic tissue is found in small quantity in the mucous membrane.

In addition to these elementary constituents, it also has an enveloping serous membrane, nerves, blood-vessels, and lymphatics, and a lining mucous membrane. During the gestative process the principal change consists in a simple hypertrophy whereby the muscle-cells enlarge from nine to eleven times their former size. A numerical hypertrophy is said to occur in the innermost layer during the first six months of gestation. The arteries, nerves, and veins also increase in size, and the structures of the mucous membrane participate in the increase. The arteries are extremely tortuous in their course through the uterine wall, and frequently anastomose with each other. The arterioles break up into a fine capillary network near the free surface of the mucous membrane. These capillaries form arches surrounding the mouths of the uterine glands and lying immediately beneath the surface epithelium of the endometrium. The veins, which are very large and sinus-like, are exceedingly thin-walled, and lie immediately in contact with the muscular structure. According to Leopold, the veins are not nearly so numerous as the arterioles in the mucous membrane, although this predominance does not persist in other parts of the uterine tissues. According to Jacobi, this extensive arrangement of surface capillaries, curling arterioles, and tortuous arteries, with the large and dilatable veins, tends to prolong the abode of the blood in the uterine mucosa, thus conducing to growth of the endometrium in menstruation and pregnancy. There is a subepithelial stratum of embryonic tissue, consisting of round cells and free nuclei, without any definite arrangement with reference to the surrounding or imbedded glands and vessels. According to the Hoggans,[2] the lymphatics begin within this tissue, directly under the surface epithelium, like the lacteals of a villus.

[1] *Arch. f. Gyn.*, vol. xii.

[2] *Obstet. Transactions*, London, p. 4, 1881.

Between these cæcal lymphatics and the epithelium of the uterine glands nothing intervenes.

According to Leopold[1] and De Sinéty,[2] the lymphatics begin in this subepithelial embryonal tissue as endothelial lined connective-tissue lymph-spaces. According to both views, these intercommunicate, and ultimately enter the subserous and periuterine lymphatics, and according to either view they are left lying patulous at the end of parturition, and to a less extent also at the end of menstruation.

Pathology.—The condition of the pathology of this subject is so crude that Thomas[3] in his last edition says of it: "The literature is scanty in the extreme as yet, and the subject awaits extended researches before we can speak intelligently of it." It is now four years since this distinguished authority wrote these words, and to-day there seems very little to change the conclusion then reached.

Hart and Barbour in an edition only a year old, as already cited, say, in referring to chronic metritis, "We are not yet in a condition to select a name resting on a sure pathological basis."

Jacobi (in August, 1885) says: "It should not be too difficult to find specimens of chronically subinvoluted uteri . . . . without the secondary connective-tissue change. But, so far, these do not seem to be reported, and we are reduced to inference from the appearance of the accessible portions of the uterus and from the clinical symptoms."

Indeed, although it seems a libel on our boasted investigation of the past forty years, not much has been added to the pathology of this subject since the last paper on subinvolution by Sir James Simpson. He made the declaration that "this retrograde metamorphosis of the uterus has not taken place during the puerperal month, or has taken place only to such an imperfect degree that the uterus is of the size we usually see it at the end of the first week or so after delivery." Without attempting a minute description of the pathological changes and conditions to be found in such an organ, he says: "Subinvolution is due to any arrest of the fatty degeneration or subsequent absorption from whatsoever cause;" from which we are to infer that his idea was that the microscope would disclose a general fatty degeneration in a subinvolution of the uterus at any time during the existence of the condition. Schroeder says that "arrest of puerperal involution is rarely a pure hypertrophy, but a change in which the fatty degeneration occurs normally, but absorption fails and new muscular fibres are not formed. The walls are thick, soft, and flabby. The uterine tissue is grayish-yellow or yellowish-red in color, very friable, and delicate mucous threads, like spider-webs, stretch across the laceration." These words are in Schroeder's article,[4] but are quoted from Klob.[5] Thus it would

[1] *Archiv für Gynäk.*, Bd. vi. [2] Quoted by Jacobi, *loc. cit.* (*Mal. des Fem.*, p. 256).
[3] *Op. cit.*, p. 315. [4] *Ziemssen*, vol. x. p. 73, 1874. [5] *Op. cit.*, p. 128.

appear that his pathology accords in the main with Simpson's in making the condition one of fatty degeneration. It is difficult to harmonize the above description with some later observations of Klob on this condition, except by supposing that he is describing a later stage of the disease corresponding to chronic metritis. He says: "The whole uterine connective tissue sometimes proliferates, either with accompanying increase of the muscular substance, or, if this does occur, the connective tissue predominates to such an extent that the muscular substance is comparatively of not much account." Later on he says: "The newly-formed connective tissue is chiefly composed of thin fibrils deficient in nuclei, which cross the uterus in lines of various breadth in all directions, forming a complicated felt-like network and constituting the greater substance of the uterus. In the first stages of the disease the muscular fibres are broader and hypertrophied, but at a later period may be completely lost in the proliferation of connective tissue."

After parturition the uterus rapidly decreases in size, until in four to six weeks it has reached its former weight, or as nearly so as it will ever do. This change is agreed to be the result of the fatty degeneration of the muscular fibres, with the subsequent absorption of this fat and its partial voidance, together with the degenerated mucous membrane, by way of the lochia. These are the means by which involution is secured. During the period of gestation the work of the uterus has been chiefly one of growth, which has brought about the general muscular hypertrophy.

When labor begins the process of "growth is charged to function"[1] for the expulsion of the uterine contents. The venous hyperæmia, which was sufficient for growth, has given place to the increased blood-supply, which constitutes the arterial hyperæmia of function. The muscular fibres, which have so enormously increased both in number and size, have up to this time been supplied with only blood enough to maintain their growth and life, and have lain comparatively dormant. At the beginning of labor the increased nutrition furnished by the copious afflux of arterial blood stimulates these cells to their proper function of contraction until the uterus is emptied. The continued contraction of the muscular fibres cuts off much of the arterial supply, and venous stagnation ensues to such an extent that even the nutrition necessary to the integrity of the cells is removed. Fatty degeneration consequently occurs as an expression of this impaired nutrition. Not only are the large muscle-cells broken down by the fatty degeneration of impaired nutrition, but also by that cellular change which occurs from the increased oxidation resulting from the contractions of labor.

Fatty degeneration begins, according to Heschl,[2] about the fourth day. It is seen, however, from the above, that the processes leading to

[1] Jacobi, *Am. Journ. Obst.*, 1885.

[2] Review in *Arch. de Méd.*, 1854.

this condition commence with the inception of labor. The fat, the product of this change, is partly absorbed by the general circulation and partly escapes from the mouths of the open lymphatics of the endometrium as a contribution to the lochia.

It is a well-known clinical fact that subinvolution of the uterus to a greater or less degree is prone to occur in women who have suffered from puerperal metritis, perimetritis, peritonitis, or some other manifestation of septicæmia. In most of these subjects the lochia was greatly diminished or completely suppressed. It is legitimate to infer that in these cases the lochial suppression may bear a causal relation to the subsequent subinvolution, since so much of the degenerated uterine tissue as would have thus been disposed of must remain or be eliminated by other channels. Since there is no authority for considering subinvolution a permanent fatty degeneration of the uterus, inasmuch as no investigator finds fat in any considerable quantity in such a diseased organ, we are to infer that fatty degeneration has not occurred, or that it has occurred and subsequently been absorbed or changed into the class of tissue found in the subinvoluted uterus.

As has already been noticed, Simpson and Schroeder seem to be of the opinion that the enlargement is due to unabsorbed fat in the uterine walls when they say that the affection is due to interference with the absorption of fatty degenerated muscular tissue; but there appears to be no microscopic authority for such conclusion.

Dr. Snow Beck[1] found that "the enlargement of the organ was due to the great increase of the round and oval bodies, with amorphous tissue in the uterine walls as well as at the inner surface, which form the soft tissue of the uterus, aided by an enlargement of the vessels." He also found no relative increase in the amount of muscular tissue; or, in other words, agrees with Klob in the absence of muscular hypertrophy.

There is indeed room to doubt whether this was a pure and simple case of subinvolution, for the patient died of typhus fever and her previous clinical history is not given. Jacobi thinks it may have been "a round-celled infiltration of the uterus under the influence of typhus fever." According to Jacobi's method of differentiating subinvolution from chronic metritis by the depth of the uterine cavity, the presumption is in favor of the latter, for the cavity in this case was but three inches deep, and she states that in subinvolution the cavity measures from nine to fourteen centimeters (3.6 to 5.6 inches).

Finn's observations[2] are diametrically opposed to Klob, Beck, Scanzoni, De Sinéty,[3] and all others, and make the diseased state due to muscular hypertrophy and hyperplasia, claiming that the muscle-cells are both increased in size and number. He also states that the con-

[1] *London Obst. Trans.*, vol. xiii.

[2] *Amer. Journ. Obstet.*, vol. i. p. 264.

[3] *Gynæcol.*, pp. 315, 351, 1879.

nective tissue is relatively diminished. Finn's report is on chronic metritis, and subinvolution is not considered, although, since his results differ so manifestly from those of others who have made pathological investigations of uteri affected with chronic metritis, it may be presumed that his case was not that disease, but some condition occupying a position between the muscular hypertrophy of the gravid state and the connective-tissue hyperplasia of well-marked chronic metritis.

Jacobi thinks this description coincides with what we may infer from the clinical symptoms and the physical condition of the uterus in subinvolution, or as "a first form of chronic metritis entirely distinct from inflammation." Thomas accounts for the great difference between Finn's views and those of others[1] in the time after parturition when the investigations were made, and says that he who examines early will probably find a greater amount of muscular tissue than he who does so later.

De Sinéty, in treating chronic metritis, compares its stages and microscopic pictures to those observed in hepatic cirrhosis—an early soft, large, hyperæmic stage, and a later hard, small, anæmic stage. He says:[2] "In the first stage the dominant lesion is the presence in great numbers of embryonic elements throughout the whole thickness of the muscular walls. These elements are met with specially round the blood-vessels or form islands of variable dimensions which are more or less apart. The second period is characterized by two changes: 1, marked dilatation of the lymphatic spaces; 2, a localized hypertrophy of the connective tissue. The sclerosis, for such it may be called, differs from a similar change in the kidney and liver in the fact that the formation of the connective tissue is localized round the blood-vessels." He is unable to say whether the muscular tissue was normal or diminished in quantity.

Mary Putnam Jacobi[3] has made a very careful study of the uterus of a woman who died eight days after parturition, in which she found the muscular fibres either hypertrophied with nuclei indefinable and disappearing, or smaller fibres with indistinct central nuclei, others still smaller with nuclei distinct, while a fourth variety without nuclei were granular and contained oil-globules. In all these the feeble manner in which the extremities of the fibres took up coloring matter seemed to indicate that the wasting of the cell began in the protoplasm and attacked the nucleus last. Among these fibres were nucleated connective-tissue cells and amorphous tissue. The blood-vessels and lymphatics were much enlarged and in immediate contiguity with the muscular tissue, which is markedly different from the perivascular condition observed by herself and De Sinéty in cases of chronic metritis.

The same author also details her own results from the examination of the uterus in a state of chronic metritis, and her observations in the

[1] *Op. cit.*, p. 312. [2] *Op. cit.* [3] *Loc. cit.*

main coincide with those of De Sinéty. She says: "The three prominent lesions found in either body or cervix of the uterus in metritis are —enlargement and multiplications of blood-vessels, dilatations of lymphatics, proliferation of scantily-nucleated connective tissue, chiefly around both sets of nutritive canals, but also, to some extent, between bundles of muscular fibres, and even within these bundles. In the hypertrophied cervix this tissue has been found even to replace muscular fibre to a considerable extent."

For such appearances as these to be derived from those found in a uterus eight days after delivery she infers—

"1. That from the subinvolved uterus the ribbon-shaped fibres, as also those filled with fat-granules and all the intermediate forms, together with the cells and granules, finally disappeared.

"2. That the lymphatic spaces and blood-vessels remained abnormally large.

"3. That the walls of the enlarged blood-vessels finally suffered some structural alteration, in virtue of which nutritive transudations of an albuminous plasma took place, which gradually caused a local development of connective tissue (perivascular sclerosis). It is this perivascular sclerosis which constitutes the cardinal difference between a pure subinvolution and a chronic metritis grafted upon it."

The question as to whether this process, chronic metritis, is an inflammation or not is very old and much worn. The authority just quoted believes that it is; and it certainly seems clear that the results of the disease, as shown in the latest researches of the microscope, manifestly place it in the category of inflammations. While the phenomena observed in a uterus affected by this disease do not wholly concur with chronic inflammations in other organs, they certainly as nearly approach such concurrence as might be expected when we consider the marked difference in the structure of the uterus as compared with other organs. The presence of the perivascular deposit plainly indicates diapedesis, the essential point of agreement in all inflammations. Some injury to the cement-substance in the vessel-walls sufficient to allow the egress of the white corpuscles from the vessels has occurred. These elements have been found to assume the same conditions seen in transudation-products in other organs, notably the liver. The hypersecretion observed clinically in this affection and the wide lymphatic spaces of the mucosa suggest that these, lying patulous in the midst of the transuded cells and plasma, are constantly busy in absorbing the infiltration and discharging a portion at least into the uterine canal. The hyperæsthesia noted in chronic metritis is a clinical symptom of inflammation. Martin of Berlin, in his textbook published in 1885, describes chronic metritis as a chronic inflammation of the uterus, although admitting some slight disagreement between this process in the uterus and chronic inflammations

elsewhere. He also adduces, as additional evidence of its inflammatory character, the fact that it is usually accompanied by inflammation of the mucosa and serosa of the uterus.

It is a matter of much regret that although subinvolution has had a more or less distinct place among uterine diseases for over forty years, no pathological testimony regarding the condition of the uterus affected with this apparently negative disease has been offered. Its antecedent step or condition, the histology of the post-partum uterus during regression, is fairly understood, and the pathological condition, chronic metritis, which is sometimes in some way superinduced or engrafted upon it, is now quite clearly demonstrated. Consequently, the real pathology of pure and simple subinvolution, a condition holding a place somewhere between the normal post-partum uterus and chronic metritis, is reduced to the uncertainty of inference.

Etiology.—Considering the etiology of subinvolution from a pathological point of view, we are yet more in the dark than in the pathology itself. A study of the morbid anatomy has enlightened us regarding its existing conditions to some extent, but offers little or nothing concerning the initial pathological causes. Klob[1] tells us it is due to a "formative irritation;" which means nothing so long as he is unable to tell us what the irritation is. The word *cause* would mean about as much as "irritation" in his definition. It is a definition which does not define. He also assigns "habitual hyperæmia" as the cause of this condition, which is rather a result of the ambiguous "irritation," or at best a secondary cause. Habitual hyperæmia undoubtedly is the initial stage of the affection, and thus stands in a causative relation to the secondary stage—infiltration of the walls with embryonic elements.

Clinically examined, the etiology seems to be better understood, and nearly all etiology classifications are clinical in character. As the term subinvolution implies, there is an impeded or retarded involution after parturition; but, again, from our conclusions on the pathology of the subject, the process is not actual arrest of involution, but a pathological process engrafted upon or coincident with uterine involution. "Habitual hyperæmia," "engorgement," "congestion," are recognized conditions in this malady at the outset, and thus, clinically, any cause leading to such conditions is a cause indirectly for their ultimate result, which we have seen to be subinvolution.

Conditions leading to hyperæmia, engorgement, or congestion of the uterus may be divided into constitutional or predisposing and exciting causes:

1. Any constitutional state which is characterized by non-resistant tissues, as tuberculosis, scrofulosis. In such women reconstructive power is much lessened, and their ability to resist and avert pathological con-

[1] *Op. cit.*, p. 127.

ditions and processes is defective. In such a patient there is a great lack of muscular power and nerve-force, which is marked as well in the involuntary muscles and nervous system of the uterus as throughout the voluntary muscular and nervous apparatus. Such are the so-called albuminous or gelatinous types of body, which are characterized by a low vitality, feeble circulation, hyperæsthesia of the nervous system, flabbiness of the muscles—which ordinarily recover but slowly from the effect of parturition, and are liable to the puerperal maladies, especially such as depend on the feeble and unhealthy contractions of the uterus after delivery. Here also the exhausting effects of lactation are much more marked, and while, as will be seen later, it acts in healthy women as a stimulation to the reduction of the uterus, in such cases it is such an extreme draft on the vital powers as to render the system less able to combat the tendency to this pathological process.

2. The weakening effect of frequent deliveries. No one can doubt the fact that cases of subinvolution are much more frequent in multiparæ, and that the number of cases increases with the number of previous parturitions through which the patients have passed. Klob says: "Frequently this proliferation of connective tissue is developed after repeated deliveries in rapid succession." Such being the case, the cause must be sought for in habitual hyperæmia. Certainly, no supposable condition of the uterus more nearly fulfils the requirements of habitual hyperæmia, engorgement, and congestion, noted as causal conditions, than the gravid condition frequently repeated. Under such conditions the power for complete muscular contraction is lost: subinvolution becomes inevitable.

3. Blood dyscrasiæ, among which may be classed such constitutions as are marked by anæmia, which is really one of the sources of the diminished vitality and want of resiliency in the reparative processes which is often among the predisposing causes of defective involution; also, conditions of spanæmia where the recuperative powers are lessened by the loss of the oxygenating and repairing influence of the fewer number of red corpuscles.

Exciting Causes.—1. Of the exciting causes connected with parturition, probably none is more prolific in promotion of the conditions leading to subinvolution than the pernicious habit of allowing puerperal woman to abandon the recumbent posture too soon after delivery. It is granted that in this regard no absolute time can be fixed as the proper limit for all cases, since it cannot be denied that involution of the uterus occurs in much shorter time with some subjects than with others.

Notwithstanding the discrepancy of authorities on this point, it may be safely assumed that in most cases involution is not complete under six weeks: nevertheless it is in most cases so far advanced at the close of the second week that leaving the recumbent posture for short periods

of time each day, with moderate exercise, will rather promote than retard this process, as such a course will add to the cheerfulness of the patient, ensure a better atmosphere, a better circulation, better appetite and digestion. On the other hand, leaving the recumbent posture while the veins are still enlarged and the uterus heavy with fat will tend toward the maintenance of the venous congestion and defeat the absorption of the fattily-degenerated uterine tissue. Such venous congestion and deficient absorption of involution-products are the first steps in the process of subinvolution. No canonical law can be established as to the exact time for which the recumbent posture should be observed. The proper time varies with each case, and must be decided by the clinical phenomena in each instance. It is a good rule to keep the patient in bed so long as the lochia rubra continue, as advocated by Lusk.[1] The continuance of the lochia rubra is a clinical expression of such active involution as is not consonant with the upright posture.

There is also little doubt that involution is not far enough advanced even at this time to permit getting up with safety. Fatty degeneration and absorption are not well performed until after the sanguineous elements from the uterine sinuses have ceased to give the red tinge to the lochia. This fatty degeneration and its coincident absorption and discharge are not well under way until the lochia alba appear. Garrigues[2] believes that involution is not so well established as to warrant the upright posture until the uterus has receded from the anterior abdominal wall and again resumed its position in the pelvic cavity.

2. Lacerations of the cervix uteri are among the most important of the exciting causes of subinvolution. When there is a lacerated tissue more blood is required to institute repair. In the lacerated cervix the increased quantity of blood needed for healing the breach answers the great requirement in the etiology of this condition—engorgement, venous hyperæmia. As a part of the reparative process, here as elsewhere, we have the exuded plasma recognized as essential to granulative repair in soft parts. Such transudation-products are, by inference, a partial source of the uterine enlargement in defective involution, and thus in Nature's attempt to restore the broken continuity we have for a longer or shorter time a literal local subinvolution. Again, considering the fatty degeneration which is taking place in the uterus during involution, the process of repair is greatly hindered. Tissues in a state of fatty degeneration are not in a favorable condition for union by granulation, much less for union by first intention. Such cases will always show a tardy involution, and in most cases a general subinvolution superinduced upon the local injury. When the patient leaves her couch, even though long after parturition, and involution is apparently complete, subinvolution

[1] *Science and Art of Midwifery*, p. 255, 1885.

[2] *Am. Journ. Obst.*, vol. xiii. p. 861.

may be caused by the weight of the uterus pressing apart the partially-united lips of the laceration. This is especially prone to occur, as pointed out by Hardon,[1] where the rent has extended through the crown of the cervix and the sides of the tear are drawn apart by the uterine supports. This deformity causes the uterus to sink downward, everts the mucous membrane of the cervical canal, and makes the lacerated cervix to rest upon the vaginal pillar. Not only does this position induce venous congestion in the whole organ, but the same end is fostered by the irritation of the cicatricial tissue, which is thus brought into prominence between the separated lips of the laceration.

3. Endometritis as a localized source of engorgement stands in a causal relation to subinvolution. The purely inflammatory form of endometritis, as described by De Sinéty, is probably chiefly associated with chronic metritis, and accounts for the clinical condition of excessive endometrial tenderness which Jacobi has pointed out in chronic metritis. The glandular and fungous forms of endometritis, as described by Olshausen and Ruge, are the most frequent concomitants of subinvolution. The exact relations of these forms to subinvolution has not been demonstrated, but since many cases of subinvolution exist without coincident endometritis, and neither glandular nor fungous endometritis is found without more or less subinvolution, it may be inferred that the disease which was primarily localized in the endometrium has led to the general engorgement of the whole uterus and a consequent subinvolution.

4. Neoplasms of the uterus may, either by the irritation set up in their locality by their presence or by pressure checking the return flow from the uterine veins, lead to a congestion which shall be followed by subinvolution. Such is the tendency of these growths even in the absence of parturition, but in the greatly enlarged, valveless, tortuous veins of the gravid uterus the tendency is greatly increased.

5. Tumors above and distinct from the uterus may so press upon the vena cava as to lead to such mechanical compression as will increase the tendency to venous congestion and subinvolution.

6. Chronic constipation may lend some aid to uterine congestion by mechanical compression, and thus enroll itself among the exciting etiological factors.

7. Excessive sexual intercourse has been frequently mentioned by authors as leading to enlargement of the uterus in the non-puerperal state. This has been chiefly alluded to as a cause for the condition called chronic metritis. Scanzoni says[2] he has seen the affection in *filles publiques*. Now, if such an habitual hyperæmia may be induced in the nulliparous uterus by excessive sexual intercourse, how much more potent a factor might such a practice be in the recently impreg-

[1] *Am. Journ. Obst.*, vol. xiv. p. 557.

[2] *Op. cit.*

nated organ, whose tissues are yet succulent and vessels enlarged—a condition inviting congestion and enhancing the susceptibility to engorgement!

8. Retained membranes, portions of placenta, or distension of the uterine cavity by clots is conceded to stand in a causative relation to this disease. Any foreign body, as the above, will exert a distending influence which mechanically increases the body of the uterus and prevents the normal action of the muscular walls, either of which leaves the vessels large and full. Aside from the mechanical influence of such bodies in the uterus, the septic conditions often induced lead to a flabby condition of the organ conducive to engorgement.

9. Post-partum hemorrhage is properly assigned as a cause of this disease. A. R. Simpson[1] has noticed that superinvolution often follows post-partum hemorrhage. Such a sequence is not strange when we consider superinvolution a last stage in the process which has subinvolution for its earlier condition; and those who make post-partum hemorrhage a cause of subinvolution, and those who make it a cause for superinvolution, are doubtless both right, though at different stages in the process.

10. Abortions may be followed by this disease. Indeed, Atthill claims,[2] and we think justly, that abortions are more likely to be followed by this malady than delivery at full term. He assigns the following reasons for this fact: The fatty degeneration of the uterus is already under way at the time of delivery at term, and thus leads to a more rapid involution of the uterus. Again, the uterus is not so well prepared to undergo fatty degeneration when growing rapidly. Probably reason for the frequency of subinvolution after abortion is also found in the fact that women are prone to attach less import to an abortion than a full-time parturition, and by insufficient care and too early getting up bring about this disease, so that the trouble is here really to be traced to exciting cause No. 1.

Galabin[3] assigns as a reason for this frequency the fact that the uterine mucous membrane, being unprepared for the separation of the decidua, and often having been previously diseased, is more apt to be left in an abnormal condition or with portions of the placenta still adhering.

11. Displacements of the uterus are among the most commonly assigned causes of uterine subinvolution, but a rational examination of the subject will call such causes in question. There is probably no subject in gynecology which has given rise to keener controversy than the etiology of displacements. Nobody seems entirely clear on the sub-

[1] *Trans. Edinburgh Obst. Soc.*, vol. viii. p. 91.

[2] Lombe Atthill, *Med. Press and Circular*, London, vol. xxxiii. p. 41.

[3] *Midwifery*, p. 341, 1886.

ject, and everybody seems to have a view remarkably well established, considering the scarcity of accurate investigation.

The uterus is a mobile organ within certain physiological limits. It is pressed downward by a full meal and with each inspiration, and an engorged rectum or distended bladder presses it forward or backward. Such movements, however, are but temporary, and the removal of the cause allows the organ to return to its normal position by means of the resiliency of its supports. It is difficult to say just where uterine movement ceases to be physiological and becomes pathological; but it is safe to assert that such movements are never pathological until there is some permanent pathological weakening in some of the supports of the organ, or a pathological increase in the weight of the organ which leads in time to a similar change in its supports; and only after such weakening of its supporting agencies can a displacement occur as a pathological condition. Thus the conclusion is reached that as a very general rule all displacements are secondary, and due to some other change or process in the pelvic viscera. Such conclusion at once greatly decreases the importance of displacements as a primary cause of subinvolution. Subinvolution is certainly more frequent, for instance, in a retroverted uterus, but the retroversion is generally caused by subinvolution or some other previous pathological process.

It is more rational and in accord with the facts to consider displacements among the results of subinvolution. When subinvolution occurs in an abnormally placed uterus as a result of the change of position, it becomes then a cause for further displacement, though not a primary cause, and is one of the class of causes assigned by all writers which increase the weight of the organ. Graily Hewitt refers all flexions to softness of the uterine tissue, which is markedly the condition of the organ in this condition, but it is not easy to suppose the flexion alone as the cause of softness. In respect to flexions, Schroeder finds the etiology in retraction of the cervix by the adhesions of peritonitis; and Schultz, in cellulitis of the ligaments, which produces cicatricial contractions and retracts the cervix. Meigs[1] finds the etiology of most versions in pathological lesions of the ligaments. An intelligent appreciation and adaptation of the facts would seem to warrant the conclusion that displacements are rarely a primary cause of subinvolution, but oftener the result of that process, and that such cases as are said to be due to displacement are in reality due to some antecedent condition which caused the displacement.

12. Among the causes which should be assigned are those conditions, generally inflammatory, which have their first pathological result in some uterine displacement, as peritonitis, cellulitis, lacerated perineum, rectal and vesical lacerations, and fistulæ.

[1] *Diseases of Women*, p. 237, 1859.

13. Deficient after-pains have been credited with a causal relation to this disease, but such relation is probably only fanciful. An exhaustive examination of the time and causes influencing involution by Ar. Serdukoff[1] leads him to the conclusion that "after-pains are not in any way necessary to involution." This conclusion was based on his own observations and the explanation of Lazarewitch,[2] which accounts for after-pains by supposing that "when violent after-pains occur they are in many cases to be considered as the violent contraction of the whole womb, particularly of its middle layer, in which run the blood-vessels and the sensitive nerves: compression of that middle layer is indicated by the painfulness of some after-pains." Such explanation does not warrant the inference that the absence of such painful impressions indicates a tendency to engraft this new pathological process called subinvolution upon the process of normal involution. Indeed, it seems fair to presume from the above explanation that severe after-pains are an expression of a hyperæsthetic, if not of a pathological, condition of the middle layer of the uterus, which would rather indicate a susceptibility or tendency to subinvolution than the reverse.

Diagnosis.—Subinvolution, from the definition of the term, presupposes one parturition or abortion at least, and nulliparity is the only condition which would exclude this form of enlargement, although a condition practically identical may occur in a uterus which has never been impregnated. The diagnosis here, as in nearly all pelvic and uterine disorders, cannot safely be made from the subjective symptoms alone, since all are vague and none in any sense pathognomonic. Our conclusions as to the presence or absence of this condition is based here, as elsewhere, upon a careful examination and comparison of the symptoms and physical signs.

Symptoms.—In most cases the patient's own history indicates that her trouble began from a previous confinement, and that she has never been perfectly well since. Weakness of the back is one of the most generally present symptoms, and often the cause of the patient's seeking relief of her medical adviser.

Leucorrhœa exists to a degree depending chiefly on the extent of the affection of the endometrium. The menstrual function is irregular. In some cases there is menorrhagia, in others amenorrhœa exists. These symptoms indicate such a diseased state of the endometrium as unfits it for the proper reception and nourishment of the fructified ovum, and as a consequence sterility is the rule. Painful defecation often exists from the pressure of the fecal matter in the rectum upon the enlarged and tender uterus, while the play of the abdominal muscles in the same act tends to the same end. Vesical tenesmus may exist from the pressure on the bladder or from dragging upon that organ by the enlarged

[1] *Trans. Edinburgh Obst. Soc.*, vol. iv. p. 59. [2] *London Lancet*, No. 7, 1867.

and displaced uterus. Dyspareunia is a normal sequence of the irritation of the engorged and hyperæsthetic cervix. The menstrual function is usually in a condition of menorrhagia, or at best the periods are more prolonged and frequent than normal. Dysmenorrhœa often occurs, the result of the physiological engorgement of the already oversensitive uterus, which leads to pain of more or less severity. It should, however, be remembered that all symptoms depending upon local uterine tenderness are not so well marked in subinvolution as in chronic metritis.

A history of repeated abortions will, when many of the above symptoms are appended, always lead to a suspicion of this disease, for although this condition tends to sterility, yet when the endometrium is not so affected as to preclude the possibility of the fertilized ovum being established in the uterus, it is often so diseased as to fail to bring the gestation to full term, and abortion or miscarriage occurs. Indeed, as has been noticed in connection with the etiology, subinvolution is more liable to follow an abortion than a full-term parturition, and thus lead to subsequent and repeated abortions, where it is the result of the first and the cause of those following.

There are also certain other symptoms which at times occur and tend to increase the difficulties of diagnosis by leading to a suspicion of pregnancy. Among these are nausea arising from an enlarged uterus and engorged rectum, the darkening of the areolæ about the nipples, and pain and enlargement of the breasts from sympathetic disturbances.

Hemorrhoids are at times a secondary result of the slowed circulation and constipation. Many and ill-defined nervous disorders and manifestations are apt to arise, depending on the temperament of the patient and the duration of the disease.

Physical Signs.—While the symptoms are vague and without accurate diagnostic significance, the physical signs are very much more valuable, and are the chief dependence in arriving at a sound conclusion as to the presence or absence of the disease. A vaginal examination in this affection discloses a large boggy cervix, often lower than normal, with os patulous, mucous membrane pouting. Pressure of the cervix in any direction by the examining finger causes pain, more marked when pressure is made in the posterior surface from the posterior cul-de-sac; pain under pressure, however, is not so severe as in chronic metritis. The whole organ, except in cases where subinvolution involves the cervix alone, will be found large and heavy, and as a rule freely movable. Hyperæsthesia of the uterus is a frequent concomitant.

An examination is also at times followed by some bleeding from the congested vessels of the cervix so imperfectly covered by the diseased mucous membrane. The speculum will bring into view an enlarged cervix, patulous os, and a congested, eroded, granular, or ulcerated

(rare) condition of the mucous membrane. Often as an exciting cause a more or less gaping laceration is seen. If the case be of long standing the field of the laceration is apt to be filled with new tissue.

In making a diagnosis the intimate relation between laceration of the cervix and subinvolution must not be forgotten. The importance of laceration of the cervix as an etiological factor has already been pointed out in the proper place, and here it may be remarked that if a laceration of the cervix is observed, the diagnosis of more or less subinvolution either of the whole uterus or of the cervix alone is almost absolutely certain. Conjoined manipulation discloses above the enlarged and diseased cervix the body of the uterus, enlarged, more globular, and less pyriform than normal, and often displaced. If the body of the uterus is not found to partake in the enlargement, the case is one of cervical subinvolution alone—a condition relatively less frequent than chronic inflammation of the cervix.

Valuable information is to be gained from the use of the uterine probe or sound, which will be found to enter the uterine canal a distance of three and a half inches or more, depending upon the severity or duration of the disease. It is well here to point out a possible source of error first mentioned by Matthews Duncan,[1] where the sound by entering an inordinately patulous Fallopian tube might indicate a much greater depth than is real. Not only does the sound pass to a greater depth than normal, but it is much more freely movable at its point, and its introduction and manipulation often provoke rather profuse hemorrhage from the fungosities of the endometrium.

Differentiation.—Since there are some conditions with which subinvolution might readily be confounded, a few remarks on its differentiation may be useful. It has some points of semblance to—

1st. *Pregnancy.*—It may be especially difficult to differentiate subinvolution from early pregnancy in lactating women, since the latter may occur without the recurrence of the catamenia, and subinvolution at this time does not exhibit itself in the character of the menstruation. Under such circumstances the only safe course is to wait one or two months for the development of the usual signs of pregnancy in a suspected case. Chief reliance must be placed upon the progressive enlargement of the uterus in pregnancy, whereas the enlargement of subinvolution is stationary. The well-recognized change in the form and consistency of the uterus, even in the early stages of pregnancy, as disclosed by bimanual examination, may be of great service in arriving at a diagnosis, but cannot be conclusive earlier than the tenth week, especially in fat subjects. Where pregnancy is suspected it is needless to say that the sound as a means of diagnosis is not to be employed.

[1] *Edinburgh Month. Journ.*, 1856, p. 1057.

2d. *Perinterine inflammations*, which are indeed among the conditions leading to this affection, cause sensitiveness to touch and many symptoms common to it, and when suspected also preclude the possibility of employing the sound with safety. Careful manipulation will disclose their localized tenderness and the asymmetry of their enlargement, while usually the cervix will be found normal in size and leucorrhœa absent. The fixedness of the uterus is a very general condition in these inflammations not usually marking subinvolution. Such inflammations, too, give rise, as a rule, to some systemic febrile action which in no way characterizes subinvolution. Moreover, the history of the case often points to the sudden inception of the trouble in these inflammations, instead of the insidious beginnings of cases of subinvolution.

3d. *Neoplasms* of various types lead to enlargement of the uterus. The most frequent of these are the fibromata and myo-fibromata. Such tumors often produce dragging sensations, pain in the pelvis and back, leucorrhœa, menorrhagia, and many constitutional symptoms observed in subinvolution. A vaginal examination usually shows a low or displaced uterus increased in size. Where the growth has attained such size as to cause the uterus to ascend out of the pelvic cavity, there is no difficulty in differentiation. Careful conjoined manipulation, however, generally enables us to make out the chief differential point, the unsymmetrical enlargement of the organ. The growth in such cases will usually be found localized in one of the uterine walls.

In confirmation of this localization the sound is of much value. There will be little if any tenderness on pressure, and scarcely any pain will be elicited by manipulation. The history will rarely date the beginning of the trouble at parturition. The cervix in these cases does not often show any enlargement. Some cases there are where the enlargement due to a neoplastic growth is so symmetrical as to render the diagnosis very difficult. This is chiefly the case where the growth is intra-uterine or submucous. In such cases mistakes in the recognition of the true condition are by no means uncommon. It is here that the dilatation of the cervix and the exploration of the uterine cavity by the finger or sound find the greatest field of utility.

A scirrhous cancer of the cervix, with its enlargement, hemorrhage, and other symptoms, may simulate for a short time the condition of subinvolution. Confusion is all the more likely because in the early stage of scirrhus of the cervix there is usually but little pain. The history, the presence or absence of cachexia, metrorrhagia, etc., will assist in clearing up the obscurity. The test originated by Spiegelberg is in this instance a valuable means of differentiation. He introduces a tent into the cervical canal, and if the dilatation is ready and regular and the cervical tissue softens, the carcinomatous character of the affec-

tion is ruled out; while if the canal dilates slowly, and on one side more than another, leaving the cervix hard and dense, the disease is presumably cancerous.

Courty,[1] in treating of the differentiation of arrested involution, says: "There are two principal characteristics which will aid in making a diagnosis and distinguishing the arrest of involution from other kinds of hypertrophy: First, the uniform softness of the uterine tissue, combined with the red color and other characteristics of gestative congestion; second, the extreme laxity of the ligaments, and consequent tendency to prolapse, or at least the indifference of position or direction of the uterus."

4th. *Chronic Metritis (Areolar Hyperplasia).*—The greatest difficulty will be met in differentiating subinvolution from chronic metritis, since in both the symptoms and physical signs differ chiefly in degree. In subinvolution the uterus is larger, softer, and less tender than in chronic metritis, where, although enlarged, it is smaller and comparatively firm. In subinvolution the uterine probe enters to a depth of three and a half inches or more and causes considerable hemorrhage, while in chronic metritis it enters to a depth only slightly greater than normal, exciting intense pain and usually followed by less hemorrhage. In subinvolution the endometritis is mostly of the fungous or glandular variety—hypertrophy of the endometrium—and consequently menstruation is usually profuse, but not so painful. In chronic metritis the endometritis is generally of the embryonic type, the mucous membrane having largely desquamated and the vegetations consisting of embryonic tissue similar to the inflammatory granulations which form upon exposed wounds. Menstruation will consequently be markedly painful, but not so profuse as in subinvolution. In subinvolution the heavy, slightly sensitive uterus produces dragging sensations, but not always distinct pain. In chronic metritis the inflamed and hypersensitive organ leads to more or less acute suffering with various irradiated pelvic pains.

Course and Results.—As has been indicated under Pathology, the tendency of this disease, untreated and uncomplicated, is to the establishment of chronic metritis, and later sclerosis of the uterus, the so-called superinvolution. The scarcity of observed and recorded cases of superinvolution until recently would indicate that the disease is often arrested in the state of subinvolution or in chronic metritis, or that the condition of superinvolution has escaped observation. Both these suppositions are probably true, and the great number of cases of superinvolution recorded recently evidences the truth of the latter, for only recently has the condition received much attention. It is also pretty well established from abundant clinical evidence that the disease sub-

[1] *Op. cit.*, p. 596.

involution is often checked, and that treatment has often brought about a *restitutio ad integrum*.

As to chronic metritis—which, according to our belief, is one of the results of subinvolution—it may be readily understood that the source of the trouble, proliferation and growth of embryonic elements, may be stopped; but how these elements, when organized, may be made to disappear is not so readily comprehended; and although clinical evidence to the fact in abundance is not wanting, yet we have no microscopic pathological investigations to attest it.

Subinvolution runs a very slow course, as is shown by the lapse of time after parturition which often occurs before it is detected. The uterus is often found to be in this condition many months or even years after a parturition or abortion, and the history clearly indicates the beginning of the trouble at the last confinement. Hence no approach to definiteness can be attempted in describing the course of subinvolution. Certain it is that the course is not uniform.

Chronic metritis is probably the most frequent termination of untreated subinvolution. Superinvolution has been mentioned, but properly comes on rather *in cursu* than as a sequel to the chronic metritis. Sterility often ensues from the incapability of the endometrium to properly receive and nourish the fecundated ovum, or abortion ensues from its inability to maintain and support a healthy placenta. The menorrhagia, pain, and attendant weakness tend to that chronic invalidism so often marked by numerous and fitful nervous symptoms. Dysphoria, occasional dysmenorrhœa, dyspareunia, menorrhagia, constipation, vesical tenesmus, enumerated among the symptoms, are results of this disease, any one of which may be sufficiently aggravated to demand treatment, and indeed be the feature which will lead the careful practitioner to a diagnosis of the underlying trouble. Displacements are chiefly related to subinvolution as a result rather than a cause. If a small healthy uterus, weighing a little more than an ounce, is liable to fall or be drawn from its position, how much more a bulky, cumbrous organ weighing one or two pounds!

The atony of the uterine walls caused by this condition of engorgement, as shown in a case reported by Kaschkaroff, tends in the third stage of labor to retention of the placenta.

The probability of subinvolution in its late stages passing into carcinoma or epithelioma of the cervix has been warmly discussed pro and con by gynecic writers. Klob considers the views of the affirmative illusory, and Thomas never saw a case. Noeggerath has written a paper to prove that the tissue of such a uterus tends to the formation of epithelioma, but no other recent author, so far as I know, sustains his views. My own clinical experience furnishes several cases in which, to my own mind, the relation between cervical laceration and a subse-

quently developed epithelioma were unequivocal, but I have never seen a single case of epithelioma which I thought due to subinvolution.

Treatment.—It is greatly to the credit of Sir James Simpson that the methods of treatment employed by him immediately on the discovery of the disease are used at the present time, and that but few additions to the therapeutic measures inaugurated by him have been made. It is rather strange that while he believed the disease inflammatory in character, and addressed his treatment accordingly, nearly all gynecologists since have rejected his views as to the cause, but retain his methods and means of treatment, including general as well as local agents.

Thomas[1] does not call the disease inflammation, but he says: "Do I myself not blister, apply leeches, and even amputate the cervix in these cases? I blister lightly to exert an alterative influence on the nerves for the relief of coincident congestion. I blister occasionally as I would for hyperæmia elsewhere, and I amputate as I would for enlarged tonsils." So would Sir James Simpson, Scanzoni, Henry Bennett, and Chomel; and they considered it an inflammation, and indeed treated other inflammations in the same way. Here as elsewhere we encounter that incomprehensible "inflammation," which seems a veritable pathological chameleon, taking its color peculiarly and faithfully from the tissue wherein it rests—now forming the plastic bands of pleuritis, now the white opacity of keratitis, now the pus of cellulitis, and again the fibrous bands of hepatitis, and so on *ad infinitum*.

All treatment looking to the cure and check of this disease is, by the agreement of most authors, addressed to the congestion or engorgement of the uterus. This is admitted to be an underlying condition indicating the course of treatment, and being at the same time its object.

For convenience the treatment is divided into prophylactic and curative.

Prophylaxis comprehends such measures as tend to prevent the occurrence of the diseased condition. In this interest labor should not be allowed to last so long, when it can be safely shortened, as to greatly weaken the recuperative powers of the system or bruise the parts into a congested condition, since debility leads to feeble uterine contractions after labor, and thus to deficient expulsion of blood from the walls of the organ and contraction of its vessels. The engorgement and atony of the parts from prolonged pressure and contusion are literally a beginning of the disease which an enfeebled general condition may be unable to thwart.

When conditions demand it, therefore, partial anæsthesia with forceps delivery should be adopted. Zealous care and skill should prevent as nearly as possible laceration of the cervix and perineum, among whose numerous sequelæ subinvolution very often occurs. In short, every-

[1] *Loc. cit.*, p. 317.

thing which obstetric science and skill can afford for securing safe and easy delivery should be employed. The binder is a useful means of promoting and maintaining uterine contraction, but if too tightly applied may cause retroversion of the yet engorged uterus, and thus indeed permanence of engorgement or subinvolution. The patient should not be allowed to maintain pelvic congestion by leaving the lying-in couch too soon, neither should she defer proper exercise so long as to discourage a healthy pelvic circulation. After the fifth day she should move about in bed and change posture frequently—change from dorsal to lateral decubitus. Constipation will engorge the local pelvic circulation, and its attendant tenesmus in defecation will aggravate the same condition, and also cause too great a pressure on the enlarged uterus, and should be avoided by the proper methods. The use of ergot for some days after delivery to assist in securing and maintaining suitable uterine contractions is generally approved. Quinine is also advised for the same purpose. While much injury is often done and this disease established by too early rising from the parturient couch, there is no doubt that the opposite extreme is productive of evil consequences. After the proper time (see remarks on Etiology) has elapsed, and the patient has had no contraindicating symptoms, cautious and healthful exercise should be advised to secure vigorous action of the general circulation and promote tissue-change, with removal of waste material and a consequent demand for food. There is little doubt that the prevalence of subinvolution and other pelvic diseases may be partly traced to the indolent life led by so many women in the wealthy classes. Sexual intercourse among such is in no way abridged to concert with their general inactivity, and this, with the monthly engorgement of the uterus by the catamenia, leads to a pelvic congestion entirely out of proportion with the enfeebled general circulation due to aimless indolence. Better rules as to exercise, with moderation in sexual indulgence, should be enjoined. Galabin ascribes much of pelvic congestion and its kindred ills to our modern sumptuous upholstery, which conduces to this condition by making the pelvis assume too low a position when sitting.

Retention of parts of placenta, membranes, or clots should be avoided as an important preventive measure. It is especially important to guard against placental adhesions and retention, when we remember, as has been pointed out by Mary Putnam Jacobi, that the point of adhesion or the irritation produced by a portion of retained placenta may prove the site of a localized subinvolution. This localization of the disease tends to induce general subinvolution of the whole uterus.

Antiseptic lotions and vaginal injections, as prophylactic to puerperal diseases when indicated by special symptoms, will also be useful in preventing subinvolution, since such diseases often pave the way for this condition. Since subinvolution of the uterus is a disease of malnutri-

tion, although perhaps generally dependent upon local causes, there can be no question that it is not unfrequently the result of generally lowered vitality, an enfeebled state of the general health, to which certain women are particularly prone after each parturition. Careful attention should therefore be given to the general health and proper constitutional measures employed. Especial care is to be enjoined in women subject to abortions; which, by the way, in Hewitt's opinion, means women affected with uterine flexions.

Curative treatment is that applied to the disease when it is found affecting the uterus, and is chiefly addressed, as has been said, to the engorgement of the uterus. It embraces means, mechanical or therapeutical, whose near or remote effect is the decrease in the amount of blood in the uterine tissue. For the sake of clearness it is well to divide these means into constitutional and local.

Constitutional treatment is here, as in most pelvic diseases, of great importance at all times, but the degree of its importance will depend largely upon the condition of each patient. A case of subinvolution in a healthy woman, due, for instance, to laceration of the cervix, will not demand much if any attention to the general health, while in a weak, nervous woman with flabby, non-resistant tissues it becomes of paramount importance, and is much more conducive to cure than is local treatment.

First among the agents for constitutional therapy are mineral and vegetable tonics. Among these iron is especially indicated where there is anæmia, and menorrhagia is not an important symptom. Mercury in the form of the bichloride is recommended in small doses over a long period for its tonic effect. The mild chloride is also of great value. The salts of iodine and bromine are very generally used by gynecologists. The iodide of potassium is indicated where there is an indication for promoting the absorbent system, while the bromide of potassium is supposed to have an especial field of usefulness where it is desirable to diminish the functional activity of the uterus.

Scanzoni recommended hip-baths containing combinations of bromine and iodine, with vaginal injections of a similar character. Arsenic is given as a stomach tonic here as in other diseases where such remedies are indicated. Strychnia is much used from its supposed ability to impart muscular tone to the abdominal and pelvic viscera. Ergot is recommended for its action on unstriped muscular tissue. Theoretically, it ought to do good, but after repeated trial I have but little confidence in it for these cases. Quinia is given as a bitter tonic to "bring about a better state of the mucous membrane of the stomach, whatever that may include" (Nickles), and thus increase the demand for food and the assimilation of it. The mineral acids are chiefly indicated from the stomach symptoms, and thus are used as tonics to increase the gen-

eral nutrition of the body. When the general nutrition is poor and little food is taken or assimilated, cod-liver oil plays a useful rôle, acting both as a food and as a tonic, leading to an increased demand and absorption of other food. The various mineral waters are recommended for use in their proper spheres, and baths of the same character are of utility in this disease by building up the general health. The writer has witnessed decided benefit from cold sponging of the entire body every morning before the patient dresses. In most cases it is better that the patient use the sponge without an assistant. Hewitt thinks that the waters at Kreuznach have a special adaptation in the bromides and iodides they contain. The same kind of waters are found at the Triton and Union Springs, Saratoga.

It is probable, however, that the chief benefits obtained from such waters consist in the change and rest for those who perform household duties, and activity for those who lead lives of idleness at home. Moreover, absence from home avoids sexual excesses, of so much injury in these cases.

Local treatment is divided into therapeutical and operative.

1st. *Therapeutical.*—The therapeutic agents employed are mostly irritants or caustics, and are either alterative, stimulant, or absorbent in their effects. The cervix may be painted with iodine to secure the alterative and absorbent effect of that drug. When the fundus of the uterus reaches above the pelvic brim, Scanzoni suggests painting the abdomen with tincture of iodine. Collodion and acetic acid for its blistering effect on the cervix, as employed by Aran, is highly recommended by Thomas, who uses it by applying several coats to the cervix at stated intervals. It is followed in ten or twelve hours by a free discharge of serum, which has the desired depleting effect on the engorged organ. Scanzoni also employs for counter-irritation iodide of potassium and glycerin. Simpson applied to the uterine canal, with his sound wrapped with cotton, various irritants and caustics. Nitrate of silver has been extensively used within the uterine cavity in these cases, and has been followed by very satisfactory results. Carbolic acid, combined with tincture of iodine, applied to the interior of the uterus, now has greater favor among gynecic practitioners than any other agent. It goes without saying that medication of the interior of the uterus is not to be attempted unless the canal is sufficiently large to permit a return flow and free discharge.

For severe cases Lombe Atthill[1] carries ten grains of crystallized nitrate of silver into the uterus, and lets it dissolve in the cavity. The same plan was carried out by Sir J. Simpson. In milder cases solutions of tannic or gallic acid may be applied to the interior of the uterine canal. Courty suggests that we may provoke the uterus to hypertrophy

[1] *Diseases Peculiar to Women*, p. 83 *et seq.*

by means of local treatment, and then take advantage of the tendency of the organ to undergo fatty degeneration and involution.

To the granular erosion of the cervix which is often seen in this disease, and to ulceration, rarely seen, various means of application are in vogue. Vaginal injections of hot water at a temperature of from 100° to 110° F. prove very valuable in the treatment of this condition. To be available, however, the *method* is important. The injection should be given with the patient in the recumbent posture, with the buttocks brought to the edge of the bed, and so placed that the outflow will wet neither her clothing nor the bedding. At least three gallons of water should be used at each session. A fountain made by use of a wooden bucket and hose with faucet will answer every purpose. The stream should not be large. The patient should invariably remain in bed for at least an hour after the irrigation. Indeed, it would be better that it be given at bedtime, so that she can remain in bed for the night. This treatment should be employed once daily. In cases where vaginal packing is employed it is good practice to place the packing in the morning before the patient arises from bed, allow it to remain during the day, and its removal at night to be followed by the vaginal irrigation. To Emmet will the profession be ever indebted for the emphasis he has given to the use of hot water in treating pelvic congestions and inflammations. Anhydrous glycerin in pledgets of cotton applied to the cervix will, by abstracting water, greatly deplete the over-full vessels. Glycerin with tannin or boric acid makes one of the most useful local applications, combining the dehydrating influence of the glycerin with the astringent power of the acid. The vagina should be thoroughly packed, especial care being taken to fill all the culs-de-sac.

When the cervix is much ulcerated or decidedly granular the caustics are generally used. Ulceration, however, is extremely rare. Nitrate of silver, caustic potash, potassa cum calce, or chromic or nitric acid may be applied according to the severity of the case. A general observance of the rule, to begin with the milder and use the stronger caustics later, if necessary, is the best method of practice. In these cases, as in all others, should nitrate of silver be employed, its well-known tendency to harden and cicatrize the mucous membrane of the cervix and contract the os must be cautiously guarded against. No local application will so speedily cure non-specific erosion or ulceration as the solid nitrate of silver. But the conditions of induration, cicatrization, and contraction resulting from its indiscriminate use are deplorable, all the more so because incurable.

The importance of electricity as a means of therapy in this disease is at last well established. In simple subinvolution the faradic current is to be employed alternately with the galvanic. In such cases "both the muscular and vascular elements require contracting, and the circulation

needs stimulation in order to hasten the normal retrograde metamorphosis. Therefore the faradic current is especially indicated."[1] When the disease has passed into the second or inflammatory stage, chronic metritis, electrolysis is indicated by means of the galvanic current.[2] The writer has had frequent opportunity of testing the value of this method of treatment.

Mechanical Treatment.—When there is displacement aggravating the disease the first step in treatment will always be its correction by the proper manipulation and support by pessary or other device.

Local therapy is nearly useless when a marked version or flexion exists which leads to a bending and compression of the vessels so as to keep up the engorgement. When a pessary cannot be borne the patient should rest in a suitable position as much as possible, while local treatment is addressed to the engorgement and its consequent tenderness. Tampons of cotton saturated with tamo- or boro-glyceride, so placed as to assist in correcting the displacement, will also, by their dehydrating and astringent influence at the same time, reduce congestion. Heavy or tight clothing always tends to aggravate displacements and should be avoided. The corset should be worn very loose, or, better, entirely abandoned, while skirt-supporters should transfer the weight of the skirts from the waist to the shoulders.

Operative Treatment.—When the cervix is large, tense, and congested, scarification or the application of leeches is advised by all authors, though now very rarely resorted to in actual practice—not because it is an irrational means of depletion, but because it is not fashionable. Depletion is the manifest object of all treatment, and certainly no means is a purer depletion than this. We have already expressed the belief that laceration of the cervix is the most common cause of subinvolution. Whenever, therefore, this condition of the cervix is found, it should be removed by trachelorrhaphy at the earliest practicable moment. The influence of the operation upon subinvolution is frequently very striking. The writer has noted many cases where not only the subinvoluted uterus and cervix have been reduced to normal size and form within a few months, but the so-called reflex nervous symptoms, together with uterine catarrh, metrorrhagia, etc., have vanished.

In this connection it is proper to state that it has been for many years the writer's custom, should metrorrhagia, menorrhagia, or even marked uterine catarrh coexist with laceration of the cervix, to use the blunt-wire curette immediately preceding the trachelorrhaphy, usually after the patient has been anæsthetized for this operation. There can be no question that the influence of this procedure should be considered as partly promoting the highly satisfactory results above referred to; all,

[1] Mundé, *Am. Journ. Obst.*, 1885, p. 1252.

[2] Franklin H. Martin, *Journ. Am. Med. Assoc.*, 1886, vol. vii. p. 67.

therefore, should not be attributed to the trachelorrhaphy. The writer has in another publication[1] expressed the opinion, founded upon a large clinical experience, that in a case where curetting is indicated it may be done at the same sitting with trachelorrhaphy without in any degree increasing its risks. This immunity from danger may be partly due to the depletion from trachelorrhaphy.

We must not be understood as recommending the curette only in cases where a degree of laceration of the cervix exists demanding trachelorrhaphy. The use of the curette is justified where there is extensive degeneration of the endometrium as evinced by metrorrhagia, menorrhagia, or uterine catarrh. Often the cleansing of the endometrium by the removal of villous or fungoid growths, and the consequent irritation set up by such an operation, will lead to an active process in the uterus which soon effects a cure of the underlying subinvolution.

The practice of amputating the cervix in subinvolution and chronic metritis, as extensively followed in Germany and to a limited extent in this country, is to be mentioned only to be condemned. We fully endorse the following language of Dr. Egbert H. Grandin: "We have yet to see the case of subinvolution where amputation of the cervix for the sole purpose of diminishing the size of the body was in the least called for."[2] This practice is also condemned in the strongest possible language by Emmet.

During the past eight years, both in hospital and private practice, the writer has demonstrated the value of removing a wedge-shaped piece from the cervix and closing the rent with sutures, as in trachelorrhaphy, both in subinvolution and chronic metritis (areolar hyperplasia), when laceration of the cervix did not exist. If a sufficient amount of tissue be removed and the sutures properly introduced, the results are frequently quite satisfactory. I always allow the incised surfaces to bleed freely before placing them in apposition, in order to produce as much depletion as possible. This practice is strongly commended by Grandin.[3]

An ingenious modification of this procedure, by which the same end is secured without incision of the vaginal mucous membrane of the cervix, is practised by Dr. Ellwood Wilson of Philadelphia.

Subinvolution of the Vagina.

Subinvolution of the vagina is that condition of the organ when post-partum regression has failed and the canal remains much larger, more flabby, and less contractile than normal.

Nomenclature.—This condition as an entity has no literature. It

[1] *Trans. Am. Med. Assoc.*, 1884.

[2] Review "Handbuch der Frauenkrankheiten," *Am. Journ. Obst.*, July, 1886.

[3] *Loc. cit.*

has had but little recognition as an underlying or complicating condition in the affections of the vagina following and incident to parturition. Such treatment as it has received at the hands of writers has been directed to those accidental deformities which are either the causes or the results of subinvolution of the vagina. Accordingly, it has been called "rectocele" when the posterior vaginal walls became unduly lax and pouted at the vulva. If that part of the vagina forming the floor of Douglas's pouch gives way and the intestines descend into the sagging pouch, it is called an "enterocele." When the anterior wall gives way through lack of tonicity and support and presents at the vulvar cleft, it is called a "cystocele." When the whole canal is in a condition of ectropion it is termed "prolapsus vaginæ." When the exciting cause is in the descent of the uterus through the lax and patulous vaginal canal, the resulting condition of the vagina has been at times called "inversion."

In whatever part of the organ the weakness of the canal is most evident, as manifested by the deformity which gives a name to the disease, the underlying pathological condition is subinvolution of the vagina.

In addition to these expressions of the *locus minoris resistentiæ*, there are found cases where the whole canal is loose, flabby, and patulous, with marked absence of normal tonicity, following a parturition, and usually associated with subinvolution of the cervix or uterus, or both. These cases are frequent. They have usually received no name, but are certainly typical examples of subinvolution of the vagina. Indeed, these are the cases generally overlooked in the search for or treatment of uterine disease. Most frequently the patient either does not realize the condition, or neglects it until the condition declares itself more distinctly in the form of cystocele, rectocele, or prolapsus vaginæ.

Pathology.—The vagina partakes in great degree in the changes which prepare the reproductive organs for parturition. Its muscular tissue is largely increased by a physiological hypertrophy. Its blood-supply is largely increased, as shown by the change in color which occurs during pregnancy. The marked fulness of the circulation is also shown in the "vaginal pulse" mentioned as a sign of pregnancy, also distinctly recognized during attacks of acute cellulitis. The vaginal papillæ become engorged and enlarged as a result of the nutrient activity in the organ, and at times a papillary vaginitis is lighted up, possibly from the venous congestion which ensues from pressure in later gestation. Also, the connective tissue is increased in quantity and its lymph-spaces are enlarged and engorged, making the whole organ softer and more distensible. In the last weeks of pregnancy the congestion renders the whole canal œdematous and stimulates the mucous follicles to increased secretion. This secretion is sometimes so

profuse that the patient, if she has heard the tradition, says she is losing her milk.

The submucous areolar tissue becomes especially œdematous, and at times the œdema so diminishes its tonicity that the descending head pushes the mucous membrane in front of it during labor by destroying the areolar attachment between the mucous membrane and the subjacent structures. When such an accident occurs subinvolution is almost certain to follow. It is probably true that this injury is rarely detected at the time of its occurrence.

During pregnancy there is a pure hypertrophy of all the vaginal tissues. The vaginal walls are lengthened, as shown by the fact that while the uterus is higher than normal, and the rugæ even more marked than usual, the mucous membrane is often seen slightly prolapsed at the vulva during latter pregnancy. That its calibre is increased is seen by the ease with which the fingers, or even the hand, may be introduced. Still, its contractility is evinced by its ability to expel the placenta when it has been discharged into the canal by the uterus.

Following parturition the vagina is reduced to its normal dimensions by the process of involution. This process is probably similar to that which reduces the uterus—a fatty degeneration of its hypertrophied elements. When this regression fails or is only partly attained from whatsoever cause, the vagina is left loose, flabby, and non-resistant. This is the state of subinvolution. The particular result of this subinvolution will depend chiefly upon the cause and extent of the condition.

No investigation has been made to show the pathological histology of the relaxed vaginal walls in a pure subinvolution; and here, again, we are reduced to the uncertainty of inference. From the increased amount of tissue in the organ, greater than normal and less than at parturition, we are to infer that the hypertrophied muscular fibres have not all been removed. Likewise, the lack of muscular tone or functional ability of the muscular fibres lends color to the inference that the sluggish circulation causes such inefficient nutrition that the fibres are incapable of normal or functional activity.

Etiology.—The causes of subinvolution of the vagina are mostly the same in kind, though differing in degree, as those producing subinvolution of the uterus.

To those conditions which bring about subinvolution of the uterus by maintaining pelvic congestion directly or indirectly the origin of subinvolution is chiefly to be referred. In addition to these causes, already recited, may be added subinvolution of the uterus, which from the intimate association with the uterus and vagina, especially by the middle muscular coat, and the intimate relations of the blood-supply, will readily induce a coincident congestion in the vaginal walls.

The most important factor in etiology is injury to the perineum and pelvic floor. These injuries may be divided into—1. Simple lacerations of the external perineum to the sphincter ani without injury to the vagina. Such accidents are not so productive of vaginal relaxation as is generally supposed. In feeble women these may lead to some degree of congestion in the vagina, and thus act as an exciting cause of subinvolution through enfeeblement of the general health.

2. Lacerations of the external perineum with the pelvic floor, including the fascia and levator ani muscles in the median line. In such injuries the subinvolution of the vagina is induced by the absence of its chief supporting agency, the levator ani muscles with their strong enveloping fascia. The vagina is a loose shut sac extending downward and forward. Its chief support is the pair of levator ani muscles, with their fascia, meeting behind and below, by which "drawstring" the vagina is slung up to the anterior pelvic wall. These muscles thus directly support the posterior vaginal wall, and it in turn supports the anterior wall and bladder. When this support is removed by laceration, the posterior wall relaxes and pouts forward as a rectocele, to be followed at times by descent of the uterus, cystocele, and prolapsus vaginæ, in order as a result of the subinvolution produced primarily by the injury to the pelvic floor.

3. When the laceration of the integumentary perineum reaches through the sphincter without injury to the levators and their fascia, more or less subinvolution is the result, although the amount of the disease and the resulting deformity are not so rapid in their appearance nor so marked in their extent.

4. When injuries No. 2 and 3 are combined, subinvolution of the vagina occurs speedily, and is followed by the conditions noticed as sequelæ of No. 3. All that was said with reference to the arrest of involution consequent upon the vascular hyperæmia which is set up for the purposes of normal repair of the uterine cervix after laceration is equally applicable to lacerations of the vagina or perineum.

5. At times, and probably more frequently than is generally supposed, there is separation of the opposite halves of the levator ani muscle at their median raphé, without any integumentary or mucous laceration. As a result, the attached ends of the muscle on each side are drawn forward, leaving the posterior vaginal wall unsupported, except by the flabby mucous membrane and the sagging tissues of the perineal body. In such cases the posterior vaginal wall drops forward and downward, followed by the rectum, constituting a rectocele. The same condition ensues when the levators suffer lateral submucous rupture, except that when the lateral laceration occurs well forward, and the median portions of the two muscles remain posteriorly to stiffen the posterior vaginal wall, the anterior wall will suffer first, the cystocele

taking precedence among the vaginal deformities produced by the resulting subinvolution.

Since each one of the vaginal deformities mentioned previously as a secondary result of injuries to the perineum and pelvic floor will be treated in their appropriate places by other contributors to this work, they will be dismissed from further consideration here, although in our discussion of the surgical treatment appropriate to subinvolution these deformities must necessarily be frequently mentioned.

6. Those cases where general subinvolution of the vagina occurs as a result of the traumatism done to the parts during labor, without either rupture or laceration of any of the structures or supports of the vagina.

Over-distension of the canal as a result of a long labor in feeble patients may so destroy the tone of the parts that the venous congestion will not be overcome by the process of involution. The fatty degeneration will occur only to a limited extent, and by removing some of the muscular fibres, whose loss will not be compensated by the new fibres which should take their places in the process of repair, will leave the canal loose and flabby without contractile power. The relaxed vagina, destitute of such muscular structure as by its contraction tends to drive out congestion and promote fatty degeneration, is in a condition favoring further congestion and maintaining its own relaxation. In time the condition simulates atrophy of the vagina in the feeble functional power of its muscular elements.

Not only may such a condition arise from over-distension of the canal during parturition, but it may arise as a maintenance of congestion and deficient involution, due to any of the causes recited under Subinvolution of the Uterus, although it does not always accompany the latter condition.

Excessive sexual intercourse, independent of parturition, will lead to a condition of vaginal relaxation practically the same as subinvolution of the vagina following parturition. There is not here, however, the antecedent element of muscular hypertrophy which marks changes in the vagina as uniformly as in the uterus during pregnancy. The vagina does not return to its normal size and tone until from eight to twelve weeks after parturition, and sexual intercourse before this time is always at the expense of proper involution. It should therefore be positively forbidden.

Treatment.—Prophylactic measures are here important, chief of which is the prevention of the traumatism of parturition. What has been said in this respect regarding prophylaxis of subinvolution of the uterus is equally true in regard to the same condition in the vagina. Indeed, so far as relates to lacerations of the vagina and pelvic floor, it is more important here than in subinvolution of the uterus, since in

these injuries involution of the vagina is more directly impaired than that of the uterus.

Every procedure indicated by the highest obstetric skill, looking to the prevention of injuries to the cervix, vagina, or perineum, is prophylactic of subinvolution of the vagina. When, however, injury, unavoidable or otherwise, does occur to the perineum, it should receive immediate surgical repair.

The same is true of the vagina. Immediate surgical repair of the cervix has not yet received general sanction, although it has been proposed in several quarters. In most instances such a procedure is, for obvious reasons, impracticable.

Dr. Ellwood Wilson, in a paper read before the American Gynecological Society in Sept., 1886, reports excellent results from the application of nitrate of silver to the freshly-torn surfaces in cases of lacerated cervix, the union being prompt, thus leaving no chronic processes favoring subinvolution of the vagina.

In all cases of perineal traumatism where, from any cause, the primary operation for repair was not successful, the secondary operation should be done within a few months, at farthest, before the necessary influences inducing subinvolution have been operative to a permanent degree. The same course should be followed in cases where the primary operation was neglected. The above remarks as to time apply equally to operations for laceration of the cervix.

Not only are the same operations, above referred to, prophylactic of subinvolution of the vagina, but the same procedures, done at a later period when subinvolution already exists, are frequently more promptly and efficiently curative than all other measures.

The constitutional treatment, including medicines, baths, exercise, air, and diet, most appropriate in the treatment of subinvolution of the uterus is equally applicable in the same condition of the vagina. The reader is therefore referred to the foregoing remarks upon that subject.

Local treatment is of signal value, and should be employed in much the same manner as detailed in the topical vaginal treatment of subinvolution of the uterus. In using the depleting powers of glycerin and the astringency of tannin and boric acid in this disease, not only should the tampons be applied to the cervix in the upper part of the canal, but the entire vagina should be loosely filled with pledgets of cotton well saturated with anhydrous glycerin, boro-glyceride, or tanno-glyceride. Topical application of tincture of iodine to the vaginal walls and vault three or four times per week is often very beneficial.

Electricity.—What has been said upon the use of electricity in subinvolution of the uterus must be emphasized in the treatment of subinvolution of the vagina. Indeed, it is the most important agent in the treatment of cases not requiring surgical aid, and may sometimes

properly supplement cases which have been surgically treated. The galvanic current alone should be used when the disease is confined to the vagina, with one pole, the negative, in the vagina—the other, the positive, in the form of a flat electrode, upon the anterior abdominal wall. It is also well at times to apply a gentle current through the posterior vaginal wall, placing one pole, the negative, in the vagina, and the other, the positive, in the rectum. The current should never be so strong as to be painful, and the application should continue for ten to fifteen minutes about three times per week. A current of low intensity and large quantity is always the most valuable in such conditions. Properly and patiently applied, no agent is more useful than galvanism in stimulating the absorbent process and hastening involution in the sluggish circulation of a flabby vagina.

In employing galvanism to the vagina in subinvolution the following general rules should be observed: 1, never use a current so strong as to be painful; 2, in the rare event that the organ is tender and painful use the positive pole, the anode, internally; 3, otherwise use the negative pole, the cathode, internally, since the catalysis induced by it best promotes the absorbents; 4, avoid the cauterization sometimes caused by the negative electrode by having its metal exposure clothed with chamois-skin.

During the employment of galvanism, as well as at all other times in the treatment of this disease, the vagina should receive copious irrigations of hot water daily, more especially just before the patient retires.

The judicious use of a pessary is often valuable treatment, especially when there is some uterine descent increasing the congestion of the upper part of the vaginal canal and rendering the vessels more tortuous. In such cases a pessary will sustain the uterus, removing its pressure, and slightly stretch the vagina, straightening its canal, thus overcoming the congestion, which promotes subinvolution.

Surgical Treatment.—When the disease is due to vaginal traumatism the only recourse lies in surgery. When the deformity of the anterior wall amounts to a condition of cystocele, the integrity of the part may be secured by Emmet's, Sims's, Stoltz's, Dieffenbach's, or Reamy's operation.

The writer has practised for several years an operation for this condition which has given him better satisfaction than any other, a description of which was published in the *Philadelphia Medical News* for Aug. 8, 1885.

In cases where there is a rectocele or prolapsus of the posterior vaginal wall, some one of the operations for narrowing the vagina is indicated. Prominent among these procedures are the operations of Emmet and Sims.

When the rectocele is associated with more or less laceration of the

perineum, both conditions may be cured by the same operation. In this field choice may be had among the procedures of Simon, Hegar, Martin, and Fritsch, all of which combine the dual objects of repairing the perineum and lessening the calibre of the vagina. In the injury to the levators spoken of by Emmet as destruction to the "drawstring" Emmet's operation should be performed.

When prolapsus of the uterus exists the operation resorted to for its cure also corrects the subinvolution of the vagina. The operations proposed for this condition are the same in kind as those devised for rectocele combined with perineal laceration. The writer in cases complicated with prolapsus uteri has met with most success in an operation upon the posterior wall similar to that already mentioned as performed by him for cystocele.[1]

This operation is especially useful in narrowing the vagina at its upper part just below the cervix, at the same time thickening the posterior wall in the same situation, and finally restoring the perineum.

In all the foregoing cases restoring the existing deformity proposes involution secondarily in two ways: First, by restoring more nearly to the norm the direction of the blood-vessels and lymphatics, and removing undue pressure which has resulted from changed relation of parts. Second, depletion, removal of tissue, with union by first intention, promote lymphatic absorption, the removal of subinvolution-elements.

[1] See *Phila. Med. News*, March, 1887.

PERIUTERINE INFLAMMATION.

By RICHARD B. MAURY, M. D.,

Memphis, Tenn.

Definition.—This term is used to designate the different forms of inflammation which modern research has shown to originate in the soft tissues of the true pelvis in woman—the tissues lying outside the rectum and bladder and adjoining the uterus, ovaries, and tubes. Inflammation is often discovered in the tissues immediately adjacent to the uterus as a result of some lesion of its structure, and may not extend beyond this locality. On the other hand, from a greater lesion a more destructive inflammation may arise, and extend into the broad ligaments, or even beyond the limits of the true pelvis, so that in consequence of such extension there may result an abscess in the iliac fossa or in the cellular tissue behind the pubes, or there may be a purulent collection in the peritoneum, the outlines of which will rise considerably above the brim of the pelvis. To both these conditions it seems quite proper to apply the term "periuterine."

Abundant autopsical evidence can now be adduced to prove that two distinct forms of periuterine inflammation may exist, each entirely independent of, and separate from, the other. To these inflammations have been given the names, according to the tissues involved, of pelvic peritonitis and pelvic cellulitis. To those circumscribed inflammations affecting the cellular tissue and the peritoneum immediately adjoining the uterus Virchow gave the names of parametritis and perimetritis.

History.—It has been claimed by some distinguished antiquaries that the ancients had a respectable knowledge of these affections. After a careful review of what has been written, I know of nothing to prove that the ancients had any intelligent ideas concerning the real nature of pelvic inflammations. Acute observers as they were, it was impossible that they could fail to see that the puerperal woman was often attacked with an inflammation in the pelvis, that not unfrequently suppuration occurred, and that the abscess discharged itself through the vagina, the rectum, or at some point on the cutaneous surface in the neighborhood of the uterus. Yet when we read the work of him who has always been cited as the foremost of the ancient gynecologists,

Archigenes, whose teachings on "Abscess of the Uterus" have been handed down to us by Oribasius and by Aëtius, we are forced to the conclusion that he had no knowledge of the tissues involved, or of the cause or of the proper treatment of these inflammations.

It has been reserved for the physicians of modern times to truly investigate and to elucidate this subject, as far as our positive knowledge of it goes. One of the first contributions which should attract our attention is the work of Puzos of France, "Mémoire sur les Dépôts laiteux," published in 1743 as a chapter in his *Traité des Accouchements*. His view of the nature of pelvic exudations was that they were simply the result of a metastasis of the milk. He locates these "milky deposits" in the iliac fossa, under the skin and the fat, and between the muscles and the peritoneum. "The most important are lodged in the cellular tissue of the peritoneum, in the broad ligaments, or in the ovaries."[1]

No important advance was then made until 1843, when Professors Doherty of Galway and Churchill of Dublin published their views in the *Dublin Journal of Medical Science*, the former under the title of "Chronic Inflammation of the Uterine Appendages occurring after Parturition;" the latter under that of "Inflammation and Abscess of the Uterine Appendages." Doherty pointed out some of the most important signs of pelvic inflammation which are to be recognized by vaginal examination—"the hardness which is tender to the touch, and as firm and inelastic as a deal board;" also the fixation and displacement of the uterus, which is bound down to the affected side. Both these men clearly declared the occurrence of exudations close to the uterus and within the limits of the true pelvis. Both considered the subject simply as pelvic inflammation. Neither undertook to discuss the tissues involved in different forms of inflammation.

The next important contribution to which our attention is directed is the work of Marchal (de Calvi), entitled *Des Abcès phlegmoneux intra-pelviens*, in 1844. The chief advance made by Marchal is in showing that puerperal and other abscesses are often located within the pelvis. Yet he does not simply describe them as intrapelvic: he goes farther and specifies the different tissues involved in the inflammation. Thus from autopsical evidence he declares the existence of—1, abscess of the subperitoneal cellular tissue; 2, abscess of the subaponeurotic space; 3, ovarian abscess; 4, intraperitoneal abscess. He also recognizes the difficulty of distinguishing during life abscess which is the result of a cellulitis from those purulent deposits which arise from inflammation of the pelvic peritoneum.

As time advances we find arising differences of opinion in regard to the tissue usually involved in pelvic inflammations. Thus a very able

[1] *On Parametritis and Perimetritis*, by J. Matthews Duncan, 1869, p. 14.

observer, Auguste Nonat, in 1850 insisted that the inflammatory swellings in the pelvis were all located in the cellular tissue, and that the peritoneum was not involved. To these swellings he applied the term "periuterine phlegmon." M. Bernutz, on the other hand, in a remarkable series of investigations, to be noticed at length in another place, demonstrated that the pelvic inflammations coming under his observation occurred at the expense of the pelvic peritoneum, and that the cellular tissue was usually not to any degree invaded. He acknowledges the existence of phlegmons of the broad ligaments, but adds that "they ought to be studied with phlegmons of the iliac fossa, of which they are a very interesting variety."

Subsequent writers have leaned to one or the other side of this controversy, being influenced to some extent, perhaps, by the weight of authority or else drawing their conclusions from the character of the clinical material furnished by the limited field of their own observations.

In 1868, in *A Practical Treatise on the Diseases of Women*, Dr. T. Gaillard Thomas presented this subject in what I believe to be its true light. From clinical and post-mortem observation Dr. Thomas accepted the teachings of Bernutz. He moreover acknowledged the independent existence of two distinct forms of pelvic inflammation, which he described as periuterine cellulitis and pelvic peritonitis. He declared that while they frequently coexist, they are entirely distinct from each other; that they may usually be differentiated; and that an effort at thorough diagnosis should always be made. He furthermore formulated rules for a differential diagnosis.

During the same year this work was followed by the well-known treatise of Dr. J. Matthews Duncan *On Perimetritis and Parametritis*. This author likewise recognized two distinct forms of periuterine inflammation, and also the importance of distinguishing them; and while he rejected the attempt at diagnosis made by Dr. Thomas, he acknowledged our indebtedness to that writer "for even attempting the difficult task." Since that time accumulated observation has served to make perfectly clear the truth of the propositions stated by these writers.

ETIOLOGY.—As early as 1853, Dr. J. Matthews Duncan declared, in substance, that periuterine inflammations were not to be regarded as separate primary affections, but that they were secondary in their nature and dependent upon inflammation of the uterus or its appendages. Prior to the date above mentioned medical opinion upon this subject had scarcely taken definite form, although a number of writers—among whom may be mentioned Velpeau, Marchal, McClintock, West, and Aran—had in a casual way expressed the belief that pelvic abscesses were often traceable to diseases of the uterus. At the present time the

general correctness of this doctrine is universally admitted by gynecological writers.

According to Winckel,[1] it has been clearly shown, from the researches of Virchow, Waldeyer, and others into the pathology of the puerperal inflammations, that in pelvic cellulitis the lacerations and ulcers of the cervix resulting from parturition produce at first tumefaction and albuminous infiltration of the intermuscular connective tissue of the uterus: then follow enlargement and proliferation of the connective-tissue corpuscles. The same process extends to the connective tissue around the uterus and the upper part of the vagina and at the base of the broad ligaments and into the tissue between the folds of the broad ligaments. At a later stage purulent deposits are formed in these and in other parts of the pelvis.

The same researches teach us that pelvic peritonitis may result from direct injury to the peritoneum by laceration through the cervix uteri or from contusion of this membrane in difficult instrumental labors. Often it originates in an endometritis which extends through the intermuscular connective tissue of the uterus to the parametric tissue, and from this to the peritoneum. Now and then the endometritis spreads through the tubes and involves the peritoneum by continuity of tissue.

The non-puerperal inflammations recognize a similar etiology. Traumatism in the cervix and body of the uterus from the various surgical procedures of gynecology, disease of the ovaries and Fallopian tubes, and extension of inflammation from the endometrium through the tubes, will, in the vast majority of cases, clearly account for them.

A study of the views of the foremost obstetrical writers of the present age will show that they, with few exceptions, believe that the puerperal inflammations are the result of the introduction of septic material into the blood, and that the avenue by which the poison gains admission is furnished by the lesions of the genital canal. This is the view now generally accepted by modern pathologists in explanation of the phenomena of surgical inflammation wherever it may arise; and to set forth this important subject in clear language I quote the words of the late Dr. William H. Van Buren, a writer who was renowned alike for his deep learning and his conservatism. According to this author,[2] "The terms *infective* and *non-infective*, introduced by Simon and Sanderson, have been so generally adopted in treating of surgical inflammations and fevers as to require special definition.

"'An inflammation,' says Sanderson, 'which is more or less exactly limited in duration and extent by the limits of the injury which has caused it may, with scientific precision, be designated a simple or normal inflammation;' that is, *non-infective*.

[1] *The Pathology and Treatment of Childbed*, translated by Jas. R. Chadwick, 1876.

[2] *International Encyclopædia of Surgery*, vol. i., "Inflammation," p. 105.

"On the contrary, 'an inflammation which spreads and endures beyond the direct and primary operation of its cause, which induces similar inflammations in other parts, and disorders the vital functions of the whole body, has in it something beyond the effects of the injury, and may be properly termed *infective*.'

"In the latest English systematic work on pathology (by T. Henry Green, etc., London, 1881) this is spoken of as one of the most important divisions of inflammation; and it is stated that 'in all infective inflammations the formation of the infective substance appears to be due to the presence of minute organisms, these organisms in the ordinary non-specific inflammations being the common septic bacteria.'"

Whilst considering the etiology of pelvic inflammations I would call attention to an instructive article by Dr. Paul Mundé,[1] in which he has placed before the English reader the results of the investigations of Championnière of Paris and Leopold of Leipzig into the minute anatomy of the uterine lymphatics. These authors have shown that the lymphatic system of the female pelvis consists of a very luxuriant and intricate system of vessels opening by multitudes of minute orifices upon the mucous surface of the uterus, and continuous with the lymph-spaces of the pelvic peritoneum. As these lymphatic canals coalesce to form larger vessels, they are seen in places to form ganglion-like expansions and to be interrupted here and there by glands, the most important and constant of which are situated in the cellular tissue on the sides of the cervix. Leaving the walls of the uterus, they travel outwardly between the layers of the broad ligament to empty their contents into the general lymphatic system of the body. A more perfect mechanism for taking up and conveying poisonous material from the lining membrane of the genital passages to the periuterine tissues could scarcely be designed.

While the active part played by the lymphatics in the puerperal inflammations has been fully recognized by obstetric writers of every nation, as Dr. Mundé says, "their influence in the transmission of septic matter and production of inflammation of the uterine adnexa *in the non-pregnant state* has by no means received the recognition it deserves." In another connection he adds: "And thus, while all authors on diseases of women speak of metritis and endometritis, of cellulitis and peritonitis, and of ovaritis, scarcely one mentions the subject of periuterine lymphangitis or lymphadenitis. What is considered and described as one of the chief factors of puerperal disease is wholly overlooked in the non-puerperal condition."

Notwithstanding all that has been said, it must be admitted that there is a class of cases, few in number, the etiology of which, in the

[1] *Amer. Journal of Obstetrics*, Oct., 1883, "Non-puerperal Pelvic Lymphadenitis and Lymphangitis."

present state of knowledge, is obscure. Thus in young girls and old women pelvic inflammations now and then are met with, going on to suppuration, in the absence of any discoverable uterine disease.

In this connection allusion should be made to the views of Dr. Thomas Addis Emmet. This distinguished gynecologist says:[1] "My convictions are that while the primary cause of uterine disease lies, through the influence of the sympathetic system, in impaired nutrition, we must look to pathological changes in the connective tissue as the immediate cause of the results we now regard as the original disease in the uterus and ovaries. These views have no reference to the puerperal state, for there I recognize the direct susceptibility of the uterus to disease and mechanical injury. Pathological changes are then brought about in the connective tissue of the pelvis as secondary to the uterine condition, and may remain long after the original lesions have disappeared. But these pathological changes may afterward so far affect the circulation, either mechanically or through the nervous system, as to become the cause of new and other forms of uterine disease." Dr. Emmet classifies the causes of pelvic inflammations as *puerperal* and *accidental*, and says:[2] "I am deeply impressed with the belief that future observation will establish the fact that the point of origin of inflammation in the pelvic cellular tissue is in the veins. . . . . That phlebitis in the pelvic cellular tissue does arise in the puerperal state was taught by Trousseau, and I verified it in the earlier part of my professional life, when my opportunities were better for studying pathological changes; but it must be left to future observation to determine why and how it occurs in the non-puerperal condition, for I have had no opportunity of establishing this point."

To the two forms of pelvic inflammation given above Prof. Courty of Montpellier has added a third. To this he gives the name of *periuterine adenitis* and *angioleucitis*. From his description we learn[3] that this affection "is often acute and the prognosis very serious when it is puerperal; more frequently it is chronic, and is then less important in itself than from the ulceration of the uterine mucous membrane, of which it is the certain sign."

The autopsies of Championnière, Leopold, and others have shown that in the puerperal inflammations the lymphatics are commonly filled with pus.

According to Courty, acute inflammation of the periuterine lymphatic ganglia and vessels is observed as a result of traumatic causes, of endometrial inflammation, or of the participation of these structures in an acute periuterine inflammation. Most frequently, however, angioleu-

[1] *The Principles and Practice of Gynecology*, 3d ed. [2] *Op. cit.*, p. 245.

[3] *A Practical Treatise on the Diseases of the Uterus, Ovaries, and Fallopian Tubes*, translated from the 3d ed., p. 537.

citis and adenitis occur in the chronic form. The disease is then recognized by the occurrence of small rounded tumors, smooth at certain points, irregular at others, situated behind and to the sides of the cervix, and loosely connected with the uterus and vaginal culs-de-sac. These tumors are smaller than the normal ovary, are less movable, and usually less painful on pressure than this organ, but in some cases are very tender to the touch.

The uterus is generally movable and often retroverted. "Apart from the symptoms, either direct or sympathetic, of the uterine malady and of the ulcer which has caused it, periuterine adenitis has special symptoms characterizing it: lumbar or lumbo-sacral pain, sometimes extending to the anus; continuance of the pains previously experienced by the patient, which are increased by marital intercourse, even when most of the apparent uterine symptoms have disappeared; pain elicited by digital touch, especially when pressure is exercised by the finger behind the uterus and laterally, and when an attempt is made to depress the retro- or dextro-uterine cul-de-sac."[1] This description by Prof. Courty is based not only on clinical observation, but also upon autopsical evidence drawn from a woman at the age of forty who died of pneumonia after suffering a long time from leucorrhœa and ulcerous-endometritis.

Dr. J. S. Carreau[2] of New York and Dr. Paul Mundé[3] have each reported a number of cases of this form of periuterine inflammation.

FREQUENCY.—It is impossible to give statistics which will fix with accuracy the frequency of occurrence of these inflammations. It is sufficient to state that they are the most common of all the disorders of women, and, in the language of Courty,[4] "it is certain that out of 100 women there will be 55 with peritoneal adhesions and showing traces more or less intense of pelvic peritonitis. Of this number there are far more married women than virgins, and more multiparæ than primiparæ."

Inasmuch as a thorough acquaintance with the peritoneum and cellular tissue of the pelvis is essential to a correct interpretation of pelvic exudations, an account of the most important anatomical features of these structures is here presented.

[1] Courty, *op. cit.*, p. 539.

[2] "Adenitis and Angeioleucitis of the Pelvic Cellular Tissue," *Medical Record*, July 2, 1881.

[3] "Non-puerperal Pelvic Lymphadenitis and Lymphangitis," *Am. Journ. Obst.*, Oct., 1883.

[4] *Op. cit.*, p. 540.

The Pelvic Peritoneum.

The peritoneum, after lining the walls of the abdomen, descends into the true pelvis and throws itself as a covering over all of its viscera. The floor of the pelvis, thus covered, is not a smooth surface, but presents many irregularities. Looking down into its cavity, we observe that the pelvis is divided quite evenly into anterior and posterior spaces by a prominent transverse fold which extends from one lateral wall to the other. Within the two layers which constitute this fold lies the uterus, and on each side of it are the ovary and Fallopian tube.

That portion of the fold which extends from the uterus to the pelvic wall and embraces the ovary and tube is the broad ligament. According to the statement of Hodge, which has recently been confirmed by the investigations of Professor Polk,[1] the broad ligament in the nulliparous woman is attached at its outer margin along a vertical line running between the sciatic notch behind and the obturator foramen in front. The base of the broad ligament can be touched by the examining finger in the lateral fornix of the vagina, except during gestation, and its outline can be distinctly felt whenever the ligament has been indurated by inflammation.

In front of the transverse fold just mentioned is a convex surface corresponding to the bladder, bounded on the sides by two curving folds—the round ligaments—which emanate from the anterior and superior margins of the uterus, sweep around the sides of the bladder, and seek attachment near the external abdominal ring.

The reflection of the peritoneum upon the anterior surface of the uterus after covering the bladder is called the vesico-uterine pouch. Of this Dr. Hart[2] says: "It does not contain intestine when the uterus is normal in position, and has therefore been unfortunately named 'pouch.'"

That portion of the pelvic floor which lies behind the uterus and broad ligaments presents three well-marked depressions or pouches. These pouches are separated by two folds of peritoneum called the folds of Douglas and also the utero-sacral ligaments. These ligaments spring from the lower lateral part of the body of the uterus and pass outward and backward to the second sacral vertebra.

The central depression between the utero-sacral ligaments, and immediately behind the uterus, is the pouch of Douglas. Behind the pouch of Douglas is the rectum. The two lateral depressions have been called by Polk the "retro-ovarian shelves."[3]

[1] "The Topographical Relations of the Female Pelvic Organs," by Ambrose L. Ranney, *Amer. Journ. of Obstetrics*, April, 1883.

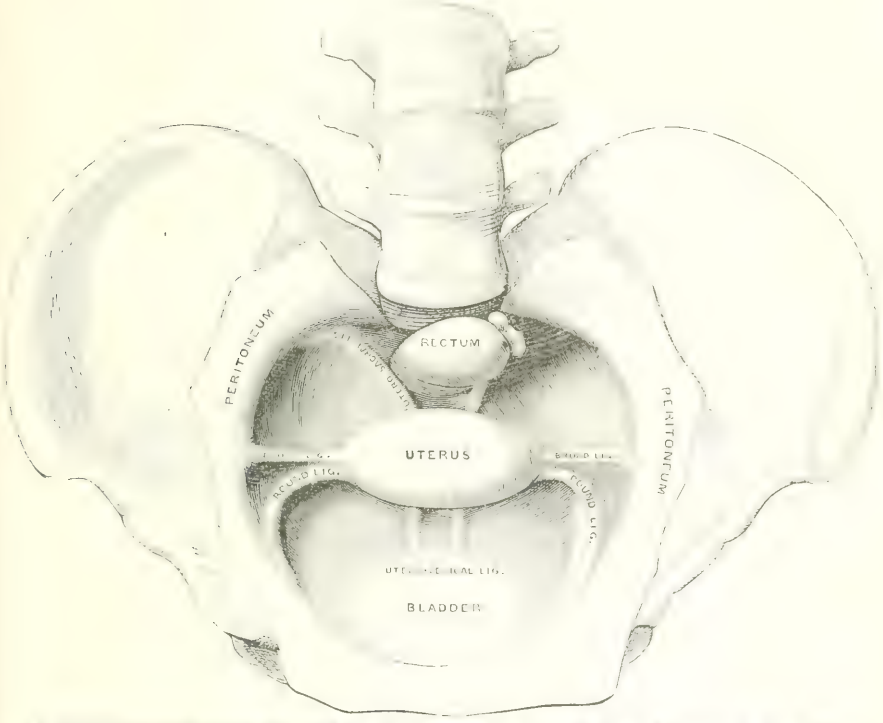
[2] *Atlas of Female Pelvic Anatomy*, p. 43.

[3] Ranney, *loc. cit.*, p. 367.

The parts above described are well shown in the accompanying diagrammatic view of the pelvis, from Hodge (Fig. 200).

While studying the peritoneum we observe that in its course downward, after covering the posterior wall of the uterus, when on a level with the os internum, it turns backward and a little upward in order to cover the posterior fornix vaginæ. It then descends along the posterior wall of the vagina a variable distance before it is reflected upon

FIG. 200.



A Diagrammatic Superior View of the Female Pelvis, showing the reflections of the pelvic peritoneum (Hodge).

the rectum. This variability in the point of reflection is one of the most important peculiarities of Douglas's pouch.

Generally, the reflection occurs on a level with the os externum; occasionally, higher up, on a level with the posterior fornix; rarely and abnormally, as low down as one inch from the vaginal orifice. Pirogoff has presented a frozen section in which the peritoneum runs down to the very apex of the peritoneal body.

The boundaries of Douglas's pouch may be stated thus: in front, the supravaginal portion of the cervix and the upper portion of the vagina; behind, the rectum; on the sides, the utero-sacral ligaments. Accord-

ing to Hart, its depth is somewhat greater on the left of the uterus than on the right.

It thus appears that all the depressions in the pelvic floor are posterior to the uterus and the broad ligaments. It is true, there is in the anterior half of the pelvis what is called the utero-vesical pouch, but it is shallow or does not exist at all when the bladder is distended, and is of no clinical importance.

While the posterior pouches, especially that of Douglas, may become the seat of encapsulated serous or purulent effusions in pelvic peritonitis, anything like a mass of peritoneal exudation in the anterior half of the pelvis is exceedingly rare.

When a vertical mesial section of the pelvis is made and the peritoneum shown in profile, it will be seen that the plane in which it lies is considerably below the plane of the brim of the pelvis.

That portion of the pelvic cavity which lies above the peritoneum has been denominated the peritoneal space, while that portion which lies below it is called the subperitoneal space. The subperitoneal space is one in which we are deeply interested, since it contains not only all the pelvic viscera, but the pelvic connective tissue which binds them together, and with them the blood-vessels, lymphatics, and nerves.

The Pelvic Connective Tissue.

The pathological anatomy of the subperitoneal pelvic space is perhaps of more importance than any other one subject connected with the diseases of women. In this space, underlying the peritoneum and investing the viscera and blood-vessels throughout the pelvis, is found the connective tissue.

The uterus, vagina, and their arterial and venous plexuses are all enclosed in connective tissue, and, as Savage[1] remarks, "This uterine cellular system is continuous at its periphery with every portion of the subperitoneal cellular tissue at the lower part of the abdomen."

Although loose connective tissue is found everywhere throughout the pelvis, lying between the different structures and binding them together, it is in some places very scant and in others quite abundant. With special reference to the clinical appreciation of inflammatory deposits in the pelvis, I may mention those localities in which the connective tissue is found in considerable quantity:

1. Behind the symphysis pubis and in the angle between the urethra and the anterior wall of the bladder, continuous with the cellular tissue of the abdominal wall—the retro-pubic fat deposit of Hart.

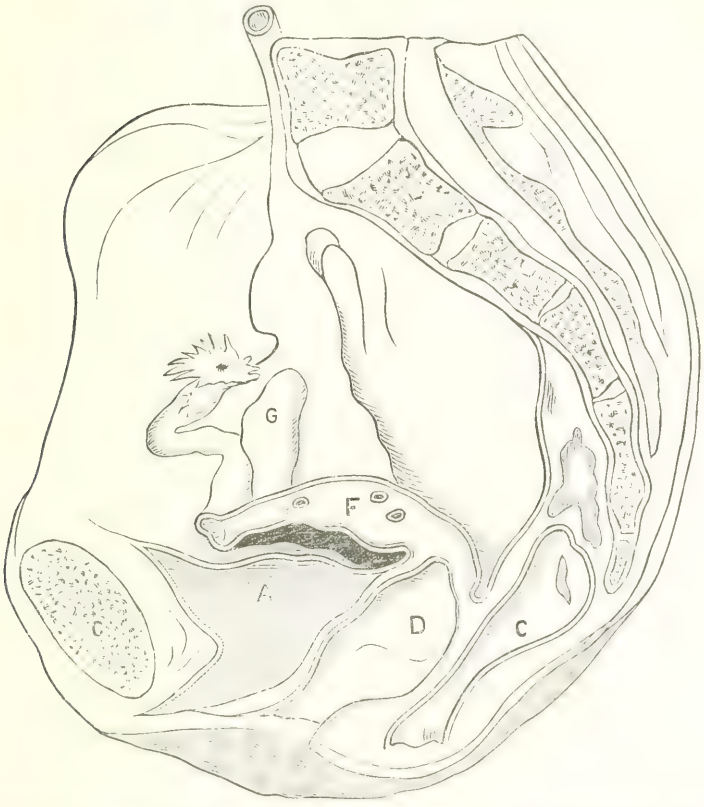
2. Between the posterior wall of the bladder and the anterior wall of the cervix, on a level with the os internum, and between the posterior

[1] *The Surgery of the Female Pelvic Organs*, 2d ed., 1880.

surface of the supravaginal portion of the cervix and the fold of peritoneum which turns down to cover the posterior wall of the vagina in its upper part. Indeed, this portion of the cervix, together with the upper portion of the vagina, is completely surrounded by a fold of loose, fatless connective tissue abundantly supplied with blood-vessels and lymphatics.

3. Along the line of junction of the broad ligaments with the uterus, between their folds, there is a large amount of connective tissue with numerous large blood-vessels. This tissue lessens in amount as the

Fig. 201.



Lateral Sagittal Section of Pelvis at junction of broad ligament and uterus. Hart: *D*, vagina; *A*, bladder; *C*, symphysis; *F*, broad ligament; *G*, ovary; *H*, Fallopian tube.

broad ligaments leave the uterus. This is well shown in Fig. 201, which is a lateral sagittal section of the pelvis at the junction of the broad ligament and uterus, taken from Hart.[1]

Between the anterior rectal wall and the posterior wall of the vagina,

[1] *Op. cit.*, plate xxii. fig. 4.

from the lowest point of Douglas's pouch to the apex of the perineal body, there is loose connective tissue.

The connective tissue lying between the peritoneum and the body of the uterus on its anterior and posterior surfaces is too small in amount to be of clinical importance.

In all the localities above mentioned inflammatory exudations occur, and can be readily appreciated by the touch; but that portion of the connective tissue which overshadows all others in pathological importance is the loose fatless layer, three-fourths of an inch in thickness, which surrounds the supravaginal cervix and the upper portion of the vagina. According to Spiegelberg,[1] "It was especially for the puerperal inflammations of these cellular sheaths that Virchow introduced the word 'parametritis.'"

The very great importance of this tissue in the etiology of periuterine inflammations arises from its intimate connection with the tissue of the cervix, it being continuous with the intermuscular connective tissue of the uterus; from the facility with which it becomes involved in the puerperal lacerations of the cervix or the injuries which the neck may sustain from gynecological operations; and lastly, from the readiness with which its numerous lymphatics and blood-vessels take up and carry into the system septic poisons.

These peculiarities of the circumuterine cellular tissue should remind the gynecologist of the risks which attend and may follow the most trifling injury of the cervix, and should make him ever cautious to avoid the possibility of septic infection of these structures.

The Lymphatics of the Uterus.

A knowledge of the lymphatic vessels and ganglia in the uterus and its appendages must necessarily throw much light upon the subject of periuterine inflammation, inasmuch as these structures are closely related to the connective tissue and constitute the principal avenues through which poisons find entrance to the system.

According to Dr. Hart,[2] "The lymphatics take their origin in connective tissue. Thus, the lymphatics of the uterine mucous membrane begin in the spaces between the bundles of fibrous connective tissue, these said bundles being covered in part by endothelial cells; that is, the lymphatics begin in spaces bounded by the endothelial covering of connective-tissue bundles.

"From these the lymphatic capillaries spring and merge into the larger vessels, ultimately opening into the thoracic duct, which of course pours into the venous system."

[1] *German Clinical Lectures*, 2d Series, New Sydenham Soc., 1877, p. 172.

[2] *Op. cit.*, p. 29.

"Leopold considers the uterine mucous membrane as a lymphatic gland, or lymphatic surface intersected with uterine glands and blood-vessels, the lymphatics being not mere vessels, but spaces between the connective-tissue bundles."

Lymphatic vessels originating in different portions of the genital canal carry their contents to differently situated glands. Thus the lymphatics of the labia, of the vaginal orifice, and lower portion of the vagina open into the inguinal glands. According to Le Bec, the lymphatics of the upper portion of the vagina unite with those of the cervix uteri at the level of the isthmus uteri. They then travel below the base of the broad ligament and empty into the obturator ganglion.

From the investigations of Leopold it appears that the lymphatics of the uterus originate in the lymph-spaces of the uterine mucous membrane. These lymph-spaces extend a little way into the funnel-shaped hollows between two muscular bundles, and then into the intermuscular spaces. When the external muscular layer of the uterus is reached, the lymph-vessels, after surrounding all the bundles, run into large valved canals at the sides of the uterus, and then pass into tubes in the broad ligament. These vessels, along with those from the ovary and Fallopian tube, empty into the lumbar glands. Lesions of the body of the uterus and lesions of the cervix may therefore be expected to give rise to differently situated periuterine inflammations.

All that is known upon this subject is admirably presented and beautifully illustrated in Hart's magnificent work.

Pelvic Peritonitis.

Synonym.—Perimetritis (Duncan, Fritz).

The term pelvic peritonitis is here applied to an inflammation, acute or chronic, of the pelvic peritoneum. It often involves also the peritoneal covering of adjacent portions of the intestines.

The earliest scientific knowledge which we possess in regard to this affection is derived from the labors of Bernutz. His investigations were first published in the *Archives générales de Médecine* for 1857, and subsequently, in more complete form, in the *Clinique médicale des Femmes* in 1862 by Bernutz and Goupil. This great work of Bernutz[1] is based upon the study of 99 cases of non-puerperal pelvic peritonitis, with 13 autopsies. The records of 7 of these cases, 6 of which were his own and 1 that of his friend M. Boucher, are in every sense complete and perfect histories. These histories present a full and minute description of the clinical features of the disease. They also describe with the greatest precision the pathological condition of the pelvic tissues as observed after death. And, lastly, they demonstrate beyond

[1] *Clinical Memoirs on Diseases of Women*, New Sydenham Soc., trans. by Meadows.

cavil the existence of an inflammation of the pelvic peritoneum, pure and simple, sufficiently extensive to destroy life and uncomplicated by a trace of cellulitis.

It is only justice to Bernutz to say that his memoirs contain the fullest exposition of this subject, and while, since his day, much has been done to confirm what he has written, no very important additions have been made to the stock of knowledge which we have derived from his investigations.

Referring to these investigations, Dr. T. Gaillard Thomas[1] wrote in 1868: "Since the publication of these views I have directed my attention particularly to this point, and from careful observation, both clinical and post-mortem, feel warranted in recording the conclusions at which I have arrived in the following propositions:

"1. Periuterine cellulitis is very rare in the nonparous woman, while pelvic peritonitis is very common.

"2. A very large proportion of the cases now regarded as instances of cellulitis are really those of pelvic peritonitis.

"3. The two affections are entirely distinct from each other, and should not be confounded simply because they often complicate each other. They may be compared to serous and parenchymatous inflammation of the lungs, pleurisy, and pneumonia. Like them, they are separate and distinct; like them, affect different kinds of structure; and like them, often complicate each other.

"4. They may usually be readily differentiated from each other, and a neglect of the effort at such thorough diagnosis is as reprehensible as a similar want of care in determining between pericarditis and endocarditis."

In 1869, Dr. Matthews Duncan said: "My adoption of Bernutz's views is not founded on clinical observation merely, but on several post-mortem investigations made by myself or for me by able pathologists."

Still more recently, Professors Spiegelberg of Breslau and Fritsch of Halle, and Drs. Hart and Barbour of Edinburgh, have accepted these views and have written in elucidation of the subject. But perhaps the surgical work of Mr. Lawson Tait in the way of removing diseased uterine appendages by abdominal section, begun about twelve or fifteen years ago, and carried on with such wonderful results as now to be familiar to the entire medical world, has, more than all else, led to a clear demonstration and a general acceptance of the views which were promulgated by Bernutz.

One of the most valuable contributions which has recently been made to this subject is a paper[2] by Prof. William M. Polk, read before the

[1] *Op. cit.*, 1868, 1st ed.

[2] "Periuterine Inflammation," *Medical Record*, New York, Sept. 18, 1886.

Society of Physicians and Pathologists, Washington, D. C., June 18, 1886. In this paper a record of 16 cases is offered in which abdominal section was made for the relief of chronic pelvic inflammation. The lesions found were salpingitis, periovaritis, and pelvic peritonitis. To this important publication reference will again be made.

PATHOLOGY.—The memoir of Bernutz, rich in anatomical material, is well worth careful study. It contains a report of 13 autopsies. After a careful study of symptoms and physical signs during life, a physical exploration of the pelvis was made at death by the bimanual, and then the abdomen was opened. In some cases it is stated that the endometrium was healthy; in others, that it was inflamed, and in 1 it was covered with pus. The pelvic viscera were covered by false membranes. Adhesions bound them to each other—the uterus to the bladder or rectum, the broad ligament to the sigmoid flexure; the Fallopian tube, bent upon itself, was adherent to the posterior wall of the uterus or to Douglas's pouch. The tube was often adherent to the ovary, its fimbriated extremity occluded, and the fimbria destroyed. *In 9 of these autopsies one or both of the tubes contained pus;* in 2 they contained tubercular material. In 1 autopsy the peritonitis was found to be due to cancer of the ovary. In 4 cases the ovaries were healthy. As a result of these autopsies it may be said that the one constant feature in pelvic peritonitis is diseased tubes—salpingitis.

As a result of the condition here described there is fixation of the uterus and the presence in the pelvis, at some point, of a tumor. The tumor consists generally of the ovaries and tubes folded upon themselves, matted together by exudation, and adherent to the posterior surface of the broad ligament or of the uterus. If the disease is chiefly on one side, the uterus will be pushed to the other side. In some cases the tumor is behind the uterus, and pushes it forward against the pelvic bone. It then consists of an accumulation of serum or pus confined in a cavity, the walls of which are the uterus and broad ligaments in front, the posterior wall of the pelvis and the sigmoid flexure behind, coils of intestines adherent by false membrane above, and Douglas's pouch and the retro-uterine shelves below.

The tubes are sometimes like hard fibrous cords, containing pus in small quantities, one of their fimbriated extremities being occluded. In other cases both extremities are closed and the tubes greatly distended, forming sausage-like tumors which can be recognized by the bimanual.

These inflammatory processes are oftentimes entirely intraperitoneal. In other cases the subperitoneal connective tissue is involved to a slight extent; and this is evidently secondary to the peritoneal inflammation.

Polk in the paper referred to says that in a large number of post-mortem examinations made in the dead-house of Bellevue Hospital

"nothing is more common than to find evidences of peritonitis about the ends of the tubes; and it is noticeable in such cases that the evidences of such inflammation diminish as you leave the extremities of the tubes."

The same writer adds: "The ovary may be said to be always implicated in this peritoneal inflammation, the fimbria which attaches it to the tube forming a ready transmitter of the process from the tube; but the extent to which it is involved must depend upon its proximity to the tubal opening and upon the degree of the inflammatory process."

Studying the inflammatory process more minutely as it occurs in the peritoneum, it may be said that the serous membrane at first becomes hyperæmic: its smooth, glistening surface disappears from loss of the epithelium, and very soon exudation appears.

In the exudation material connective tissue rapidly forms, and if but little free fluid is effused to separate the opposing surfaces, adhesion takes place.

Very often there is an abundant exudation of fluid which separates completely the opposing surfaces. In this fluid, which is of a clear, yellowish appearance, flakes or shreddy masses are seen floating, and the inflamed surfaces themselves are covered with a yellowish or reddish friable substance composed in the main of connective tissue and known as pseudo-membrane.

Resorption of fluid may now occur to some extent, and the opposing surfaces, coming in contact here and there, become adherent. Thus cavities are formed, within the walls of which fluid still remains, and thus peritoneal tumors are produced. These tumors may undergo enlargement by the addition of increased secretion.

In the severer forms of peritonitis, such as we see in the puerperal woman, the fluid is almost from the beginning purulent. In other cases the exudation may be sero-fibrinous for a time, but in consequence of some reaccession of inflammation the cells floating in the serum rapidly proliferate, and suppuration results as a secondary event.

We have, then, as clinical facts, *adhesive peritonitis*, *sero-adhesive peritonitis*, and *purulent peritonitis*.

Etiology.—The occurrence of pelvic peritonitis in any given case implies a pre-existing lesion of the uterus, ovaries, or tubes. In many instances—indeed, usually—endometrial inflammation, salpingitis, and pelvic peritonitis are simply stages of one and the same morbid process.

The causes which give rise to this disease are—

1. *Traumatic Influences.*—In certain unexplained conditions of the sexual organs the slightest traumatism may produce a fatal peritonitis. Such a result has happened from the application of nitrate of silver to the cervix, from the use of a sponge tent, and from the passage of the uterine sound. Sometimes this inflammation is traceable to blows over

the abdomen, to venereal excesses, to the vaginal douche, to the use of stem-pessaries, and to surgical operations on the cervix.

2. *The Entrance of Foreign Substances into the Pelvic Cavity.*—Intra-uterine injections may enter the peritoneum through the tubes when the cervix has not been well dilated, and they will be quite sure to produce peritonitis. The same result will follow the rupture into the peritoneum of an abscess of the ovary[1] or of an ovarian cyst, or any pelvic abscess, rupture of a pyosalpinx, of a tubal pregnancy, or some one of the branches of the ovarian venous plexus.

3. *Menstrual Disorders.*—Of the 99 cases which formed the basis of the memoir of M. Bernutz, 20 were set down to disturbances of the menstrual function. The circumstances under which menstrual pelvic peritonitis occurred were as follows: In 3 cases of incomplete menstruation no cause was apparent; twice it occurred after severe dysmenorrhœal pains; fifteen times after sudden suppression. Of these 15 cases, the cause of the suppression in 9 was cold; severe mental emotion in 3; a speculum examination in 1; cauterization of the cervix in 1; frequent sexual intercourse during menstruation in 1.

I have frequently observed pelvic peritonitis in washerwomen, who stand much with their feet in the wet, and in prostitutes as a result of the application of cold water to the genitals during menstruation for the purpose of stopping the flow and thereby enabling them to ply their vocation. The effect of cold in both instances is probably to first induce an endometritis, which deranges the menstrual function.

4. *Gonorrhœa.*—There were 28 out of Bernutz's cases attributable to gonorrhœa. This large proportion, he says, was due in part to the social condition of the women who were admitted to the Lourcine, and in part to some peculiarities in the management of the hospital. In his cases the peritonitis never appeared before the eighth day of the disease, rarely before the fourteenth, frequently at the end of the month, corresponding to the menstrual return. It was the result of a gonorrhœal endometritis extending by continuity of tissue along the Fallopian tubes to the peritoneum.

Noeggerath has called attention to the pernicious influence of "latent gonorrhœa in the male." In this form the gonorrhœal inflammation is supposed to have been long cured, but there exists in reality a granular inflammation of the urethra at some one point producing scarcely any appreciable discharge or other symptoms. Proper exploration of the urethra reveals a stricture of large calibre. This condition I have

[1] Abscess of the ovary in the non-puerperal woman is of unusual occurrence, but well-marked histories are narrated by Mr J. C. Cullingworth and Mr. Lawson Tait. The abscess begins by suppuration of separate follicles; these subsequently coalesce, and form an abscess of the entire gland. Rupture of such an accumulation would cause a rapidly fatal peritonitis (Tait on *Dis. of the Ovaries*, 4th ed., p. 127).

repeatedly known to produce a vaginitis, endometritis, and salpingitis very soon after marriage, when the cause of trouble was not suspected by either husband or wife.

5. *Parturition, Abortion.*—Pelvic peritonitis often follows parturition, and its occurrence is frequently associated with a history of repeated abortions. In many of these cases there will be found a history of endometritis and salpingitis antedating the pregnancy; and during the period of confinement there is observed for the first time an extension of inflammation from the endometrium to the pelvic peritoneum.

Clinical observation leads me to believe that repeated abortions are often the result of an endometritis, which probably operates in their production by impairing the integrity of the fœtal attachments. During the abortion, from some inappreciable cause, the endometrial inflammation extends along the tubes to the peritoneum. The parturient processes seem to furnish the opportunity for propagation of an antecedent inflammation.

This association of pelvic peritonitis with the puerperal state and abortion was observed by Bernutz. Of his cases there were 43 following the parturient act; 35 of these occurred after delivery at term, and 8 after abortion. In many of these cases there was admission to the blood of poisonous material through lacerations of the uterine canal. In others there was probably an endometritis, induced by special exciting causes, such as venereal excess prior to and causing the abortion, exertion too soon after labor, or cold.

Before the introduction of antiseptic methods rapidly fatal peritonitis was often observed from septic poisoning.

Polk in his paper remarks: "An item of interest in many of the cases is the appearance of abortions and miscarriages as etiological factors."

After childbirth inflammation of the pelvic cellular tissue is the lesion most commonly observed. It, as well as the accompanying peritonitis, is of a septic character. According to Winckel,[1] who has made many autopsies, the trouble begins as a catarrhal endometritis, and extends through the intermuscular connective tissue of the uterus to the parametric tissue, and thence to the peritoneum. He says in these cases it is rare for the inflammation to spread through the tubes.

6. *Tubercle, Cancer.*—Tubercular pelvic peritonitis may supervene slowly, as a diathetic manifestation, upon pre-existing pulmonary disease, and scarcely attract attention during life. It may develop simultaneously with the pulmonary disease, it may precede it, or it may run its course without any pulmonary complications. Usually, tubercular

[1] *On Childbirth*, translated by Chadwick, 1876.

peritonitis has been preceded, at some period more or less remote, by an attack of simple pelvic peritonitis.

The cancerous form of the disease is the result of extension of uterine cancer to the parametric tissue, and thence to the peritoneum.

7. *Uterine Flexions and Versions.*—An enlarged and displaced uterus, by doing injury to the neighboring peritoneum, may give rise to a mild adhesive peritonitis. So also does a roughened, enlarged, and displaced ovary.

8. *Pelvic Cellulitis.*—Pelvic peritonitis very often—indeed, generally—exists wherever there is a pelvic cellulitis. The anatomical connections between the two structures are very intimate, and both inflammations are the result of a common cause. I do not think it strictly correct to say that the pelvic cellulitis is the cause of the peritonitis.

While considering the influence of all the varying causes which have been enumerated, it is important to remember a fact which is clearly established by the autopsies of Bernutz; that is, the almost constant association of diseased Fallopian tubes with pelvic peritonitis, and the frequent existence of pelvic peritonitis unassociated with pelvic cellulitis. Abdominal sections and post-mortem observations by Polk and others substantiate the truth of these conclusions.

SYMPTOMATOLOGY.—Pain, severe and paroxysmal, is the most prominent and the most constant symptom of acute pelvic peritonitis. This pain, located in the hypogastric and iliac regions, may come on suddenly and without premonitory warnings, or it may be preceded for days by feelings of weight and pelvic discomfort. The slightest movement of the body intensifies the patient's suffering. Micturition and defecation become painful. Great anxiety is depicted in the countenance, dark circles are seen beneath the eyes, and the patient clamors for relief. The dorsal decubitus, with the thighs flexed, is the position generally assumed. The abdomen in its lowest part is sensitive to the lightest touch. It is somewhat swollen, and is resistant to pressure, but in the beginning of the attack, before exudation occurs, it is resonant on percussion. In most of the cases gastric symptoms constitute a marked feature, and nausea and vomiting occasion much distress. The bowels are usually constipated, though occasionally there is diarrhœa. The pulse is small and frequent or else feeble and depressed, not reaching 100. The temperature in many severe cases will reach 105°; in most cases its range is moderate, yet, as will presently be shown, there are many exceptions to this rule.

But the manner of invasion of pelvic peritonitis is variable. In some instances it is abrupt and well marked, being introduced by a chill. At other times it approaches slowly, there is no distinct rigor, and several days elapse before its character is established. These cases are of the subacute or chronic form, and their real nature may at first

be easily overlooked. Instead of well-defined pain, there will be only soreness through the pelvic region. The patient perhaps does not go to bed, but complains of languor and debility, and there is a slight febrile movement in the evening.

One of the earliest symptoms of this disease is a moderate metrorrhagia.

These are the conspicuous features of pelvic peritonitis. It should, however, be borne in mind that the symptoms will differ very greatly in different cases. This will not be a matter of surprise when we remember that a variety of pathological conditions underlie pelvic peritonitis, or, in other words, that the peritoneal inflammation is in itself only a symptom of several different morbid states.

Braxton Hicks[1] has stated that in some malignant cases of septic origin all the usual symptoms are wanting, "the rapid pulse and pyrexia, coupled with a peculiar expression of countenance, being almost our only guide." The abdomen in these cases is filled with a purulent fluid, and vaginal examination discovers none of the usual physical signs.

In reference to the symptom of pain, which is so characteristic of peritoneal inflammation generally, it may be stated that sometimes, even in extensive suppurating peritonitis, there is no pain whatever. Bernutz emphasizes this fact, and Duncan[2] says: "I might adduce cases of gonorrhœal ovaritis, commencing in healthy girls and ending in the fusion of all the parts in the pelvis into a solid, immovable mass, without the patient losing a cheerful, and even gay, visage, or making any great complaint of pain, unless interrogated closely, and then alleging the chief suffering to be from irritable bladder."

The range of the thermometer is also a feature which presents great variations from the course described. Although very high temperatures are often seen in peritonitis, the thermometer may be scarcely above normal, or even below it, in the gravest cases. "Subnormal temperatures are especially common in peritonitis, and always suspicious: death may follow these closely. High and rising temperatures do not add, *per se*, arguments for an unfavorable termination, although adding another dangerous element to the case. It is not so much the actual height as its constancy which must be feared, as must also great and irregular fluctuations between very high and very low temperatures, similar to pyæmia, common in endocarditis, less frequent in inflammations of the pericardium, pleura, and peritoneum: these are always highly dangerous."[3] Very serious cases with a temperature never going above 100° during their entire course are of common occurrence.

The progress of the disease varies greatly, and no precise limit can be

[1] Quain's *Dict. of Medicine*, 6th ed., "Pelvic Peritonitis." [2] *Op. cit.*, p. 78

[3] *Medical Thermometry*, Wunderlich, Seguin, p. 167.

assigned to its duration. If the inflammation be a simple adhesive peritonitis, the symptoms may attract but little attention, and no knowledge be had of the attack during life. Should the patient die from some other cause, adhesions attest its occurrence. If the peritonitis be due to rupture of a tubal pregnancy about the sixth or eighth week of gestation, all inflammation may disappear in four or five weeks, the ovum become encysted, and convalescence be slowly established.

If the morbid condition be diseased tubes, with perhaps hydro- or pyosalpinx, no limit can be fixed to the duration of the consequent peritonitis. It continues indefinitely with frequent exacerbations, and induces a condition of confirmed invalidism of the most pitiable kind. The earliest period at which an attack of the sero-adhesive variety may be expected to terminate is four or five weeks, and it will often continue much longer.

One characteristic feature of the disease which has not yet been mentioned is a tendency to exacerbations. The patient may seem to be approaching convalescence, when all at once, without appreciable provocation, there will be a return of pain, a rise of temperature, and an increase of the exudation in the pelvis. The cause of this sudden change may be some physical exertion on the part of the patient, or else that determination of blood to the pelvic organs which precedes menstruation. Very often the exacerbation will be inexplicable except upon the view suggested by Mr. Lawson Tait, that there has been rupture of an occluded and distended tube, or that of Matthews Duncan, the rupture of small follicular dropsies in the ovary. Generally, these exacerbations are induced by the escape of the contents of the tubes into the pelvic cavity.

In very protracted cases there will usually be found purulent collections at some point in the pelvis. The occurrence of suppuration will sometimes, but by no means always, be indicated by rigors, fevers of the hectic type, and night-sweats. After pus forms, unless it be completely evacuated by surgical or natural means, a cachectic condition arises which sooner or later gives rise to certain secondary affections of grave importance. Bernutz has placed these in a very clear light before us, and they are familiar to all who have studied this disease.

The first of these secondary affections is an extension of inflammation through continuity of tissue to the abdominal peritoneum. The second is a catarrhal and often ulcerative inflammation of the mucous membrane of the entire intestinal tract, giving rise to an intractable diarrhœa. About the time this affection arises a third is often added, to which Andral has previously directed attention; that is, a form of broncho-pneumonia with profuse purulent expectoration. The condition of the patient now closely resembles that of one in an advanced stage of pulmonary consumption.

Chronic Pelvic Peritonitis.—There is much of truth in the remark of Bernutz, that in chronic peritonitis "one only of the elements of the affection is really chronic—viz. the uterine, the tubal, or the ovarian affection which originated the peritonitis, and which, with each aggravation of the malady, sets up fresh peritoneal mischief, thereby modifying the condition of the periuterine swelling."

It is very probable that many of the cases of chronic or recurrent pelvic peritonitis owe their long continuance to the escape into the peritoneum of inflammatory products from a distended tube. This is especially true of gonorrhœal cases.

While the chronic form is often the result of an inflammation which was at first acute, very many cases are essentially chronic from the beginning, the patient being for long more or less of an invalid, and not taking to her bed except at the menstrual periods, when she is then forced to do so from pain and slight febrile movement. In other cases the chronicity appears to be due to the influence of some previously-existing constitutional taint, such as syphilis or tuberculosis.

M. Aran said,[1] "At least two-thirds of the women who suffer from chronic pelvic peritonitis are the subjects of tuberculosis."

Physical Signs.—In many cases an exploration of the pelvis will reveal to the examining finger great tenderness over the entire pelvic roof and resistance upon pressure on all sides of the uterus. At the same time, the vaginal culs-de-sac are clear; no tumor can be anywhere felt; the inflammation is not localized. The position of the uterus is that which it occupied in health, and any attempt to change it produces pain. Fixation of the uterus is absolute—a degree not attained in uncomplicated pelvic cellulitis.

In other cases to the physical signs just enumerated that of tumor will be added. This tumor is close to the uterus, and yet distinct from it, the two being separated by a groove. The tumor is composed of false membranes binding together portions of the pelvic viscera, to which a pyosalpinx is often added; or it may consist of an encysted serous or purulent effusion in addition to the above.

This tumor has many of the signs of a phlegmon, but may usually be distinguished from it by the following characteristics:

I. *Its Position.*—(*a*) It occupies the latero-posterior part of the uterine circumference, being situated in Douglas's pouch, and extends at the same time into one of the retro-ovarian shelves. It then necessarily pushes the uterus and one broad ligament forward in proximity to the pelvic bone.

(*b*) It may be an encysted serous or purulent effusion, having for its lower and lateral boundaries the walls of Douglas's pouch. It will then carry the uterus and both broad ligaments upward and forward

[1] *Leçons cliniques sur les Maladies de l' Utérus*, p. 716.

against the pubic bone, and the anatomical outlines of this pouch will be clearly defined on the posterior wall of the vagina. The entire posterior half of the pelvis is then occupied by the products of inflammation.

(*c*) Another form of tumor is a small, well-defined swelling the size of a pigeon's egg or larger, occupying one of the lateral culs-de-sac situated behind the broad ligament, separated from the side of the uterus by a groove, and extending to about the level of the fundus. Such a tumor may consist of a small serous or purulent collection enclosed by false membranes extending from the sigmoid flexure to the left broad ligament, the ovary and Fallopian tube forming part of the mass.

A tumor of any size situated in the utero-vesical pouch is very rare, because of the shallowness of this pouch; hence we scarcely look for a peritoneal accumulation in front of the uterus.

II. *The Changeable Nature of the Tumor.*—Bernutz called attention to its disappearance, and reappearance in perhaps a different situation, at short intervals. While I have repeatedly observed this, it has been particularly noticeable in chronic cases which I would see at intervals of one or two weeks. The change in position was often so marked that I might have doubted the correctness of the previous examination had I not made a careful record of the exact size and location of the tumor.

III. *Peritoneal Tumors are Extremely Sensitive to the Touch.*—As a rule, they rarely extend above the superior limits of the pelvis, and can be explored only through the vagina. In cases of long standing, however, the inflammation may gradually extend beyond the limits of the pelvis, and the tumor then become abdominal. Occasionally, I have seen abdominal tumor form in recent cases when there was no ground for the suspicion of hæmatocele or rupture of an extra-uterine pregnancy.

Differential Diagnosis.—The diseases most likely to be confounded with pelvic peritonitis are pelvic cellulitis and intraperitoneal hæmatocele. That from which its differentiation is most difficult and most frequently called for is pelvic cellulitis. In some cases this differentiation is impossible: the two diseases coexist, all the structures of the pelvis are involved, and the only diagnosis possible is pelvic inflammation. In other cases the diagnosis can be satisfactorily made. It should always be attempted, not only on the ground of scientific accuracy in the study of disease, but because of its practical bearing upon prognosis and treatment. A careful study of the case in all its aspects, and an intimate acquaintance with the anatomy of the pelvic peritoneum and cellular tissue, by enabling the observer to locate precisely the exudation, will often lead to the formation of a correct opinion.

The etiology is of the first importance as an aid to diagnosis. Cellulitis is an inflammation essentially acute in its character, generally associated with a well-marked septicæmia, and apt to eventuate rapidly in suppuration. It commonly occurs after labor or abortion, and may follow gynecological operations upon the cervix. In this form it is also associated with salpingitis and pelvic peritonitis.

But pelvic peritonitis may also occur as a septic inflammation, and terminate rapidly in death uncomplicated with cellulitis. Bouchut's case, occurring after menstrual suppression from cold (reported by Bernutz, Case III.), was evidently of this character.

Dr. H. C. Coe, the pathologist to the Woman's Hospital of the State of New York, in a paper entitled "The Exaggerated Importance of Minor Pelvic Inflammations,"[1] makes the following statement: "Of half a dozen fatal cases of hystero-trachelorrhaphy and incision of the cervix, in which I have enjoyed the rare opportunity of studying carefully the sequences, in every instance the cause of death was acute diffuse peritonitis. The inflammation could be traced straight up from the wound along the mucous membrane of the uterus as an endometritis, along the tubes as a pyosalpinx, and then to the peritoneal cavity. In none of these cases was there any evidence of acute cellulitis, although old cicatrices were not wanting."

Peritonitis usually, however, is not of a septic character. The causes which give rise to it are well known and have already been enumerated. It is generally the result of disease beginning in the vagina or uterus, giving rise to an endometritis, and spreading rapidly or slowly, in an acute or chronic form, by continuity of tissue as a salpingitis, until the peritoneum is reached.

The importance of differentiating peritonitis from cellulitis does not attach to those pelvic inflammations which are associated with a well-marked septicæmia, for here both structures are usually involved; but to the more chronic forms, and to those attacks of simple acute inflammation of which the memoir of Bernutz affords so many examples.

The chronic forms to which I refer have been fully described by Polk in the paper spoken of. They have also been discussed by Coe as "minor pelvic inflammations," and by Dr. Frank P. Foster[2] as "lesser pelvic inflammations." They are characterized by inflammatory masses in the pelvic roof, on the sides of or posterior to the uterus, by the presence of circumscribed areas of periuterine inflammation; by areas of "induration," "resistance," or apparent "thickening of the tisues" situated most commonly about the base of the broad ligaments or near the utero-sacral ligaments; and are painful on pressure.

By some, these localized inflammations have been regarded as chronic

[1] *The New York Med. Journ.*, May 15, 1886. [2] *Ibid.*, Jan., 1881.

cellulitis, by others as peritonitis. Emmet[1] laid great stress upon them, and upon the importance of their recognition, and he has regarded them as the result of a limited cellulitis. He described them as being most frequently found under the posterior face of the left broad ligament, in close proximity to the cervix or extending backward along the right utero-sacral ligament. He says: "If thickening at any point can be detected, or an unusual amount of pain be elicited by pressure of the finger, it will be inadmissible to institute any surgical procedure or to attempt to reduce the uterus if it is retroverted, to introduce the sound, or to make any application within the uterine canal."

In many cases these tender points or localized areas of inflammation are easily overlooked in examining the pelvis, for they are *not* at the base of the broad ligament, but are high up and require a far-reaching finger to detect them. The opinion that these areas are the result of cellulitis is held chiefly by those who have been guided by clinical observation alone.

Since Emmet's work was written the results of abdominal section, so extensively practised during the past two years in Europe and America, have contributed largely to the elucidation of this subject. In fact, they have demonstrated that the exudations here described, and for so long considered as cellulitic in character, are in reality the products of a peritoneal inflammation. Thus, Polk in the paper referred to presents a record of cases "in which the symptoms and signs present were those of pelvic cellulitis and pelvic peritonitis, but in which abdominal section showed salpingitis, periovaritis, and peritonitis. In two of the cases there was slight œdematous swelling of the cellular tissue in the broad ligament just beneath the spot at which an inflamed tube had rested; in the remainder the most careful examination failed to detect the slightest induration or swelling in any part of the cellular tissue that lay about the uterus or between the peritoneal layers of the ligaments."

In these cases the bimanual exploration of the pelvic organs was employed before and after the operation. After removing the diseased uterine appendages, the swelling could not be found in a single case. This is testimony of the most positive character.

The same conclusions in regard to the nature of these swellings have been reached by those who have had opportunity to make post-mortem examinations. Thus, Coe, in the paper referred to, states: "Peritonitis is certainly the most prominent element in most of these cases, as far as the post-mortem appearances afford any light." In a different connection he says: "By far the greatest number of these indurations are situated high up in the broad ligaments, and consist of cicatricial masses mostly confined to the peritoneum, of tubes or ovaries sur-

[1] *Principles and Prac. of Gynecology*, 1884.

rounded by old adhesions, or occasionally of an imprisoned knuckle of intestine.

"The thickening of the utero-sacral ligaments so frequently alluded to in works on gynecology has, when carefully dissected out, proved in my experience to be due not so much to a disease of the connective tissue of these ligaments as to a cicatricial condition of the peritoneum covering them." . . . . "I confess that I have rarely (perhaps half a dozen times) found such thickenings in the cadaver which could be referred to a pure and straightforward cellulitis or inflammation of the connective tissue; and this, too, where I have recognized by the vaginal touch (*before* and *after* death) what seemed to be an induration, a distinct band extending outward from a deep laceration of the cervix, or a condition of tension in or above one lateral cul-de-sac which did not exist on the opposite side."

Polk makes the following statements: "In a large number of post-mortem examinations made in the dead-house of Bellevue Hospital it is noticed that, excepting those patients who have died of septicæmia, it is the rarest thing to find pelvic cellulitis, unless the cellulitis be clearly secondary to a previous inflammation of the pelvic peritoneum."

This evidence is adduced here in full in order to show that the common, every-day form of chronic pelvic inflammation which attracts the attention of the gynecologist, as well as the simple acute pelvic inflammation which is met with unconnected with septicæmia, is pelvic peritonitis associated with diseased appendages, and is not pelvic cellulitis.

Intraperitoneal hæmatocele will be characterized by the following history: Shock, anæmia, pain, and vomiting are the symptoms which, all of a sudden, announce the occurrence of hæmatocele if the hemorrhage be copious. Then, should the bleeding cease and reaction occur, coagulation of the blood begins and peritonitis ensues. The effusion being walled in by lymph, a tumor is formed which at first is soft and fluctuating. As more lymph is effused and the coagulum becomes firm, the tumor grows hard and resistant. This tumor, like that in pelvic peritonitis, is usually retro-uterine, and pushes the uterus upward and forward against the pubes. Unlike recent peritonitis, there is usually in hæmatocele an abdominal tumor.

But hæmatocele often fails to make itself known by rational symptoms. Of 28 cases reported by Bernutz, the diagnosis being confirmed in 20 either by puncture or autopsy, symptoms of hemorrhage were present in 8 only. Symptoms indicating syncope or collapse are very often absent even in large hæmatoceles.

In these cases, inasmuch as the physical signs are identical with those of peritonitis, a diagnosis may not be possible unless suppuration occurs. When it becomes necessary to open the abscess, the discharge of coagula with the pus will then reveal the true nature of the attack.

Occasionally hæmatocele follows upon peritonitis, as shown by Virchow, the hemorrhage being due to the rupture of new vessels in the false membranes.

Though it be a digression from the subject we are considering, yet, as strictly related to it, mention may here be made of a symptom which has long been known as colica scortorum. It is an interesting incident in the history of pelvic peritonitis, and when present may serve to make clear a diagnosis which without it might be obscure.

This is an agonizing pain on one side of, and deep down in, the pelvis, coming on from time to time without provocation, and accompanied or followed by a purulent discharge from the uterus. During the attack the pulse becomes depressed and feeble, the surface is covered by a cool perspiration, and the pain is often so severe that nothing short of hypodermic doses of morphia will afford relief.

Exploration of the pelvic organs will in many cases reveal no tumor; no evidences of inflammatory exudation may be appreciable, but there will be tenderness over the pelvic roof. The patient suffering thus gives the history of prolonged invalidism, of fevers, emaciation, abdominal tenderness, with meteorism, painful and otherwise disordered menstruation. The symptom most characteristic of these cases is a history of repeated attacks of pelvic inflammation without appreciable cause.

Colica scortorum, though generally due to a gonorrhœal endometritis, is not always so. It signifies occlusion and distension of a Fallopian tube—pyosalpinx—the uterine mouth of the tube being still open. The attacks of pain are due to contractions of the muscular walls of the tube in the endeavor to expel their contents through a small orifice into the uterus.

This is Lawson Tait's[1] explanation of the symptom, and it accords with my own observations. I have observed this symptom in several cases where there could be no doubt as to its true meaning or as to the diagnosis, and yet a physical exploration of the pelvis would throw very little if any light upon the subject. The tubes could not be felt, nor would there be any trace of tumor.

Referring to this subject, Fritsch[2] remarks: "It is noteworthy that there are cases of this nature in which, despite agonizing suffering for years, neither distinct adhesions nor tumor appear."

Dr. Thomas Savage,[3] speaking of disease of the tubes, states: "In some instances I feel sure there is nothing to be felt in the pelvis before operation, and we have nothing to guide us but the more or less constant pain and recurring attacks of inflammation."

Prognosis.—Simple adhesive pelvic peritonitis usually runs a mild course, and complete recovery ensues. The uterus is often displaced

[1] "A Clinical Lecture," *N. Y. Med. Journ.*, Oct. 18, 1884. [2] *Op. cit.*, p. 285.

[3] "Diseases of the Fallopian Tubes," 1883, reprint from *Birmingham Med. Rev.*

and fixed beyond remedy by adhesions to the rectum, to coils of intestine, and occasionally to the bladder.

Septic peritonitis is attended with a very grave prognosis as to life. Peritonitis of gonorrhœal origin usually implies sterility and invalidism for years. Purulent peritonitis is a much more serious form than the sero-adhesive variety. The puerperal state adds much to the gravity of the case. In attacks of even moderate severity the prognosis should be guarded.

In view of the frequency of collections of pus in the tubes, grave accidents are liable to happen in any case.

A high pulse and temperature indicate a severe attack, but, as before shown, a low temperature does not necessarily imply a favorable prognosis. Wunderlich says: "Hyperpyretic temperatures in peritonitis lead us to suspect an infectious origin, and indicate a speedy death with a high temperature."

The extension of the disease beyond the limits of the pelvis adds greatly to the danger. It may then be regarded as general peritonitis.

Although this form of pelvic inflammation often entails many untoward results, such as atrophy of the ovaries, obliteration of the tubes, and fixation of the uterus in a false position, and, in consequence of these, disorders of menstruation and sterility, yet it is not uncommon after the severest attacks, in which life for a time hangs by a thread, to see recovery complete and all the sexual functions re-established. Menstruation again goes on normally, adhesions undergo absorption, the womb recovers its proper position, and conception occurs.

Treatment.—The most important principle involved in the treatment of acute pelvic peritonitis is the maintenance of absolute physical rest. Every movement of the body should be prevented as far as possible, and the patient should not be allowed to rise or to leave the bed for any purpose whatever until convalescence is established. In order to put this principle in practice opium in some form must be freely administered, and it must be continued to the verge of moderate narcotism until the acute stage of the inflammation has subsided. After this the doses should be diminished to the point of keeping the patient quiet and free from pain.

In severe attacks the hypodermic use of morphia will be required to bring the patient under the influence of the drug, and for a time this method of continuing its use will be necessary. As soon as possible, however, it is better to substitute for it the administration of opium by the stomach.

At first no effort should be made to move the bowels, but after several days have elapsed calomel may be given in one-grain doses every three hours until three or four grains have been taken. Then, with the aid of an enema, a very gentle purgation will be the result, the gastric

symptoms will be lessened, and the bad effects of opium upon the secretions will be diminished.

While purgative medicines must be used with extreme caution, or not at all, in peritonitis, we must by such gentle measures as these throughout the disease take care that fecal accumulations do not occur.

In the very beginning the application to the abdomen of hot turpentine stupes or hot poultices affords much relief to the pain. Heat applied to the extremities will also be required in the state of depression which often characterizes the early stages of peritonitis. Among the remedies which experience has shown to be of great value is a blister, which should be placed over the hypogastrium. In conjunction with this a poultice of cooked starch should be made to cover the entire abdomen. When the blistered surface has healed the blister may from time to time be reapplied with great advantage; and as long as the products of inflammation are appreciable, warm moist dressings, in some form or other, should be worn over the abdomen.

If the temperature runs high, reaching 104° or 105°, instead of the measures just mentioned the rubber coil or some other device for the continuous application of cold to the abdomen should be used. Antipyrine also, either by stomach or enema, is of the greatest value in the reduction of temperature.

Throughout the acute stages of the disease the diet should be milk and lime-water, pancreatized milk, buttermilk, and animal teas. Buttermilk is nearly a perfect diet, theoretically and practically, for fever patients.

Chronic cases are to be treated by a repetition of blisters, the external use of iodine, and the wet compress. At the same time, the utmost attention should be paid to the improvement of the general health by sunlight, by the introduction of food and tonics into the system, and in some cases by passive exercise in the open air and by a change of climate.

In many of the chronic cases we shall find displacement of the uterus backward, tenderness and fulness and resistance upon pressure in the region of the tubes, and one or both ovaries enlarged, displaced, and very sensitive to the touch. Uterine mobility is also impaired.

One very important principle in the treatment of such cases is rest. With this should be combined sunlight and good diet. The strictest attention should be paid to the improvement of the digestion and to the avoidance or relief of constipation. Iron, cod-liver oil, malt, and the hypophosphites are the medicines usually found most beneficial in such cases.

Much may be accomplished for the relief of the inflammation by local treatment also. The Preissnitz compress, or wet bandages covered with rubber cloth, may be worn around the hips continuously, night and

day, until the skin becomes tender and irritated. The hot vaginal douche, used in large quantities twice a day, at a temperature 115° to 120° F., while the patient is in the recumbent position, is an agent of great value, for the knowledge of which the profession is indebted to Emmet.

The application of the strong tincture of iodine to the vaginal roof, and the filling of the upper part of the vagina with absorbent cotton which has previously been saturated with pure glycerin, will do much toward emptying congested tissues, relieving pain and soreness, and promoting absorption of the exudation.

Cautious, gentle efforts by manual or other pressure should be made to restore the uterus to its proper position if it has been displaced. But the use of the sound or the probe or the repositor for this purpose will be attended with very great danger of provoking a fresh endometritis, a salpingitis, and a peritonitis. If the retroversion can be corrected, a pessary may be watchfully used to keep the uterus in place, provided the tenderness has been previously removed by the means just described.

In some cases, after the peritonitis has disappeared a most troublesome feature will remain and baffle the most patient and persevering treatment. One of the appendages, the ovary or the tube, will remain displaced, tender, adherent in Douglas's pouch or in one of the retro-uterine shelves, and we cannot dislodge it. The patient will suffer much from this alone. She will experience nearly constant pain, inability to stand or exercise—will be nervous and suffer from backache and from irritable bladder.

After the appendages have been fixed by adhesions in the manner and position here described, I know of no means which we possess for dislodging them save by removal through abdominal section.

While much of good can, as a rule, be accomplished by the plan of treatment just described, cases are frequently met with in which no improvement whatever follows. Repeated attacks of inflammation arise from time to time, exhausting the patient's strength, or else, at some period in the history of a case which perhaps has been chronic from the beginning, violent, acute symptoms are developed, indicating general peritonitis.

The proper treatment for such cases is now generally admitted to be that which has been made clear by Mr. Lawson Tait. His method consists in opening the abdomen by an incision between the umbilicus and pubes, removing the diseased ovaries and tubes which tend to perpetuate the inflammation, evacuating accumulations of serum and pus, carefully cleansing the peritoneum, and in proper cases making use of drainage. This method is a rational deduction from the pathology of pelvic peritonitis as it was given to us by Bernutz. It is also the application of a surgical principle which has afforded the best results in the

treatment of purulent inflammations in other cavities of the body lined by serous membranes.

This surgeon, who has obtained such brilliant results from abdominal section, says: "By no means the least satisfactory groups in the above list are those of acute and chronic peritonitis. In these cases absolute cures have been effected, in every instance by the simple plan of opening the peritoneal cavity, cleaning it out, and draining it for a short time. That they were cases of an extreme kind might be shown by their details, but probably one will suffice. I take the following description of the patient's condition from a letter written to me by Dr. Justin McCarthy, who sent her to me: 'The condition in which I found her was one of the greatest emaciation: seldom have I seen it greater, unless in the last stage of phthisis. There was an enlargement of the abdomen of rapid growth, and she had incessant vomiting and diarrhœa.'"

In addition to these, Mr. Tait published in the *British Med. Journ.*, June 28, 1884, 5 cases of extra-uterine pregnancy operated on by abdominal section shortly after rupture of the tube. In these cases he was practically called upon to deal with a severe peritonitis, since the condition was marked by rapid pulse and high temperature. Four of these cases were thus successfully treated. Very soon after he published his results in 18 other cases, making 23 in all, with but a single death.

The cases to which treatment by abdominal section is applicable may be classified under the following heads:

1. Those chronic cases in which the sufferer has made full use of the treatment discussed in this article without benefit, and has become a helpless invalid.

2. Those cases in which the condition resembles the last stage of phthisis, and the presence of pus is indicated by the symptoms of hectic.

3. Chronic cases in which the symptoms have become suddenly and urgently acute, and there are good grounds for the conclusion that rupture of a pyosalpinx or an ovarian abscess has occurred.

4. Acute cases in which the pulse and temperature run high, and the history justifies the presumption that the peritonitis is due to rupture of the tube from a Fallopian pregnancy.

To-day there is nothing better established in surgery than the treatment, in proper cases, of peritonitis by abdominal section and drainage.

Pelvic Cellulitis.

Synonyms.—1. Periuterine phlegmon (Nonat); 2. Parametritis (Virchow, Matthews Duncan, Schroeder); 3. Periuterine cellulitis (Thomas).

The term "pelvic cellulitis" is here applied to an inflammation of Virchow's parametric tissue, which surrounds the cervix and upper portion of the vagina; and of the connective tissue which extends from the sides of the uterus between the layers of the broad ligaments. Originating thus, the inflammation may extend to the connective tissue in other parts of the pelvis.

Etiology.—Inflammation of the cellular tissue in any part of the body may arise from traumatism applied directly to the tissue itself; or from extension of inflammation from some adjacent organ; or else from septic material introduced at a remote point and conveyed to it by bacteria through the lymphatic and blood-vessels.

Pelvic cellulitis, pure and simple, is a rare disease. It is most commonly met with after parturition, and is associated with an evident septicæmia. The inflammation is not confined to the cellular tissue, but usually involves also the endometrium, the membrane lining the tubes, and the pelvic peritoneum.

In this, the puerperal form, the cellulitis has its origin in a septic infection, the poison being introduced from without, and gains admission to the system through some one of the numerous abrasions to which the genital passages are liable in parturition. Its occurrence is intimately connected with the presence of bacteria; and it is now quite generally conceded that for the production of the cellulitis there must be bacteria, which are introduced from without. There must also be solution of continuity in the tissues of the vagina or the cervix, through which the bacteria gain entrance to the blood.

Striking proof of the truth of this view is furnished by the experience of the New York Maternity Hospital. Since the adoption of Garrigues's method of prophylaxis,[1] the percentage of sepsis has been reduced to .21; before its adoption the percentage of sepsis was 6.06. The introduction of the same method into the Boston Lying-in Hospital[2] has reduced the percentage of sepsis to .0.

Steurer's microscopic investigations of the Strasbourg epidemic, under the guidance of Von Recklinghausen, showed that from the diphtheritic patches on the vulva and the vaginal and uterine mucous membrane "bacteria could be traced between the muscular fibres and deep down into the canalicular spaces of the connective tissue, where their presence gave rise to cellulitis."[3]

In the non-puerperal woman pelvic cellulitis is chiefly observed in connection with surgical operations upon the cervix uteri, and is here

[1] *Antiseptic Midwifery*, by Dr. H. J. Garrigues, 1886.

[2] "Antiseptics in Obstetric Practice," by W. L. Richardson, M. D., *Boston Med. and Surg. Journ.*, Jan. 27, 1887.

[3] *Science and Art of Midwifery*, by W. T. Lusk, A. M., M. D., 1882, p. 617.

also of a septic character. It is not a simple cellulitis, but is associated with peritonitis, as in the puerperal subjects.

The old method of treating uterine polypus by deligation was not unfrequently followed by a septic inflammation, which upon autopsy was found to be pelvic cellulitis with abundant evidences of peritonitis.[1]

Dilatation of the uterus by tents, particularly sponge tents, has so often been followed by severe and even fatal cellulitis that the physician who uses them except for good reasons and after surrounding his patient by all known safeguards, lays himself justly open to censure.

While, then, such is commonly the etiology of pelvic cellulitis, to use the words of Fritsch,[2] "it would be sacrificing truth to a principle were we to assert that every parametritis is a traumatic affection based on infection." For in young girls and old women pelvic cellulitis sometimes occurs without any recognizable lesion, and now and then our attention is called to it in women in whom no uterine disease has previously been suspected.

Circumscribed inflammations of the cellular tissue, non-septic in character, probably arise from injury of the tissues of the cervical canal, the process being propagated by continuity through the intermuscular connective tissue to the connective tissue on the sides of the uterus or to that between the peritoneal folds constituting the utero-sacral ligaments. This is Bandl's explanation of utero-sacral cellulitis.

Emmet[3] has met with two cases of cellulitis in children between eight and ten years of age, and the records of his private hospital contain the histories of 15 cases of cellulitis after the menopause.

When we consider the change which our views have undergone within the last few years in regard to the differentiation of pelvic exudations, some doubt might naturally arise, in the absence of autopsies, concerning the true nature of these cases. But Aran[4] reported the case of a woman eighty years of age whom he examined, and in whom he found a swelling on the side of the uterus encroaching on the lateral wall of the vagina, which after death was found to consist of indurated cellular tissue, presenting, under examination by Ch. Robin, numerous fibro-plastic cells.

In some cases the cellulitis is due to a hæmatoma. In these the effusion of blood takes place between the layers of one broad ligament by rupture of its vessels or from the veins of the parametric tissue.

Pelvic cellulitis is essentially an acute disease. If at times it appears

[1] *Diseases of Women*, by Alfred H. McClintock.

[2] *Diseases of Women*, by Heinrich Fritsch.

[3] *Op. cit.*, p. 249.

[4] *Leçons cliniques*, p. 657.

to be chronic, it is so because of its association with pelvic peritonitis, to the continuance of which it owes its chronicity.

Professor Freund of Strassburg has described a chronic inflammation of the pelvic connective tissue which has no acute stage. To this he gave the name parametritis chronica atrophicans circumscripta et diffusa. An account of his investigations has been presented to the English reader in the admirable manual of Hart and Barbour,[1] and from that source I derive my information.

The etiology of this form of cellulitis circumscripta is to be found in ulcerative processes in the bladder, rectum, and uterus. Ulcerations in the bladder and rectum produce inflammation in the connective tissue surrounding those organs. Cicatricial formations with atrophy and contraction are the result, and the uterus is made to deviate from its normal position. Cicatricial tissue on the sides of the bladder gives rise to right and left retroflexions of the uterus.

The result of dysenteric or simple follicular ulcers in the rectum is cellulitis in the utero-sacral ligaments, which causes pathological anteflexion.

Laceration of the cervix is assigned as a cause of chronic cellulitis at the base of the broad ligaments. This in time produces lateral displacement of the uterus, compression of veins and nerve-filaments, with cervical catarrh and reflex pains.

Pathology.—This form of pelvic inflammation is of very frequent occurrence. Hart and Barbour remark: "Thus, split cervix, so common in women who have borne children, is almost always associated with some cellulitis at the base of the broad ligaments."

The first result of inflammation of the cellular tissue is a sero-fibrinous exudation from the blood-vessels. The tissue is then infiltrated by young cells which arise from proliferation of the connective-tissue corpuscles. Their ranks are rapidly swollen by the emigration of white blood-corpuscles from the capillaries.

As a result of pressure from this exudation and the crowding of young cells, complete stasis of blood occurs in the capillaries; necrosis of the intercellular substance takes place; liquefaction follows, and suppuration is the result.

If the inflammatory process stops short of the formation of pus, resolution occurs, and the result is the production of a fibrous material whose characteristic property is contractility. This is cicatricial tissue.

Cicatricial tissue in one of the broad ligaments causes a lateral version of the uterus; in the utero-sacral ligaments, traction upward and backward of the cervix, which gives rise to pathological anteflexion with its consequences, dysmenorrhœa and sterility.

Some writers allege that cellulitis *never* exists alone, but is always

[1] *Manual of Gynæcology*, 3d ed., Edinburgh, 1886.

associated with more or less pelvic peritonitis. There is sufficient evidence to show that this opinion is incorrect.

Courty[1] declares that he has seen a phlegmon of the right broad ligament open into the rectum, and one of the left ligament into the vagina, without giving rise to any symptoms of peritonitis; also, cases of chronic cellulitis giving rise to cicatricial bands, with displacement of the uterus, without a symptom of peritonitis during life, and leaving no trace which could be discovered at death. He quotes Frarier's case of suppurating phlegmon of the right broad ligament opening into the bladder, the autopsy proving that the peritoneum did not participate in the inflammation. In Behier's case a suppurating phlegmon of the left broad ligament extended to the iliac fossa after delivery, and terminated fatally. There was no alteration of the peritoneum. Courty adds that an equally conclusive case has come under his own observation. The same author quotes the published cases of Simon and Alph. Guérin as conclusive examples of ante-uterine and retro-uterine cellulitis without organic alteration of the serous membrane.

I have myself carefully observed in a non-puerperal woman an extensive exudation going on to suppuration in the cellular tissue of the left broad ligament and side of the pelvis. During the entire history of the case there was absence of pain and tenderness in the exudation. After death, from double pneumonia, there were no signs of peritonitis.

These cases must be considered as exceptional. Usually, autopsies show all the pelvic viscera matted together by exudation, the cellular tissue infiltrated with pus, the uterus, ovaries, and intestines adhering by fibrinous bands, and the Fallopian tubes dilated by serum and pus.

Pelvic cellulitis may be *general* or *localized*. When general, it begins in the parametric tissue, extends thence to the broad ligament, involving all the connective tissue between its folds. It then travels to the side of the pelvis, perhaps going into the iliac fossa, or along the side of the bladder to the retro-pubic cellular tissue and that of the anterior abdominal wall. The most common seat of pelvic cellulitis is the connective tissue of one of the broad ligaments. It is seldom that both broad ligaments are involved at the same time.

As death is exceedingly rare in cases of simple circumscribed pelvic cellulitis, we have to rely for the proof of its existence on clinical evidence almost entirely. Fortunately, this evidence may be very satisfactory, because of the ease with which the tissue around the cervix can be reached by the examining finger. This is especially true in regard to the small swellings in front of and behind the cervix. The swellings which are formed on the sides of the uterus have long been the subject of dispute, and involve much more difficulty in diagnosis. Nonat

[1] *Op. cit.*, p. 532.

claimed that they were all due to phlegmons of the parametric tissue. Bernutz, on the other hand, showed by his autopsies that they are often the result of pelvic peritonitis.

Dr. Thomas,[1] who has examined the post-mortem reports of a large number of authorities, states "that, so far as his knowledge extends, there are only two cases of such limited cellulitis substantiated by autopsic evidence—one reported by Demarquay, the other by Simon." He considers that "one of these, that of Simon, is conclusive of the possibility of such disease; that of Demarquay is doubtful, for with the abscess in the cellular tissue there was also one in the cul-de-sac of Douglas."

In addition to this unquestioned case of Simon's, Courty,[2] quotes a similar one by Alphonse Guérin resulting from direct traumatism in the ablation of a polypus situated in the anterior wall of the cervix. He also refers to an important autopsy by Naudier,[3] which is quoted here as not only conclusive of the possibility of such disease as we are considering, but as demonstrating the occasional existence of large retro-uterine cellulitic abscesses.

Naudier's patient suffered from hypertrophic elongation of the neck. "The abscess which was evacuated through the anterior wall of the rectum extended behind the whole of the vagina, the whole posterior surface of the uterus, and laterally to the inferior border of the left ovary; pelvic peritonitis had only slowly followed the formation and evacuation of this abscess; the annexes of the uterus and the parts surrounding Douglas's space could not be considered as the starting-point of this retro-uterine cellulitis: the case proves these two points."

Lymphangitis and phlebitis are generally found coexisting with cellulitis. We must regard the lymphangitis merely as the result of the operation of the poison, which while travelling along the lymphatics has caused the cellulitis. Phlebitis in the puerperal woman, Trousseau taught, is the result of an extension of inflammation from the uterine sinuses along the walls of the veins. In the non-puerperal cases it is probably at first a periphlebitis due to extension of the cellular inflammation to the sheath primarily, and later to the inner coat of the vein.

Routes along which Pus Travels.—It is important to observe the routes along which pus travels in the pelvic cellular tissue.

In puerperal cases, when pus forms in the iliac fossa it usually works forward and points above Poupart's ligament. Very rarely it behaves like a psoas abscess, and, making its way beneath Poupart's ligament, forms a tumor on the inner aspect of the thigh. Puerperal abscesses not unfrequently travel downward alongside the vagina and open in the labium, or at some other point near the ostium vaginæ, or

[1] *Op. cit.*, p. 478, 5th ed.

[2] *Op. cit.*, p. 533.

[3] *Annales de Gynécologie*, vi. 293.

through the integument near the anus. In other cases still the pus makes a way through the sciatic foramen, and opens through the gluteï muscles or through the obturator foramen.

Very frequently these abscesses open into the vagina, the uterus, the bladder, or the rectum. The non-puerperal cases nearly always open into one of these viscera. It is rare for them to open into the peritoneum, though Dr. McClintock[1] says: "It is very remarkable that while three of the seven non-puerperal cases of abscess were brought to a sudden and abrupt termination by bursting of the sac into the peritoneal cavity, no such accident ever occurred in all my experience of pelvic abscess succeeding to parturition."

Usually, the direction in which the inflammatory process travels will depend on the route taken by the lymphatic vessels. But, as Lusk remarks, it also "follows prearranged pathways in the connective tissue." This has been shown by the experiments of König and Schlesinger, who injected air, water, and liquefied glue at various points in the pelvic connective tissue, and then studied the direction taken by these substances.

Symptoms.—Pelvic cellulitis in the *puerperal* woman may be circumscribed, or limited to the parametric tissue on the sides of the uterus, and may not extend beyond the nearest lymphatic glands. This, however, is very rare, for in most cases the inflammation spreads from the intermuscular connective tissue of the uterus along the lymphatics, causing a lymphangitis, and involves the connective tissue of the broad ligament, and often that of the iliac fossa also.

Under these circumstances the adjacent peritoneum is usually inflamed also, so that, practically, we can seldom differentiate cellulitis from peritonitis. Hence puerperal pelvic cellulitis can scarcely be considered separately from pelvic peritonitis.

In the account of symptoms here given I have followed Dr. Lusk,[2] who borrows from Olshausen.

Hardly ever later than the fourth day after labor, and most usually on the second or third, the patient has chilly sensations or else a decided chill, followed by rapid rise of temperature. On the second and third days of the fever the thermometer in the axilla rises higher and higher, so that there is often registered a temperature ranging from 103° to 105°. This fever then gradually subsides, ending in about 70 per cent. of the cases in seven or eight days, in 20 per cent. in two weeks, and prolonged beyond that period in only 10 per cent. of the cases. If the fever continue into the fifth or sixth week, it will probably be due to the occurrence of suppuration. Suppuration may, however, occur in severe cases within a week from the beginning of the attack.

The fever does not, however, always pursue the course here described.

[1] *Op. cit.*, p. 50. [2] *Op. cit.*

Sometimes, after a few days, the temperature will be normal in the morning, but elevated in the evening, so as to lead to a suspicion of its being malarial in character. Doubt about its nature can usually be removed by a physical exploration of the pelvis, which in case of inflammation will reveal an area of tenderness in close proximity to the uterus.

The pulse ranges from 120 to 140 per minute. It rarely goes above 120 in inflammations of moderate extent. Its persistence for twenty-four hours in the neighborhood of 140 is indicative of septicæmia.

In many cases the chill is accompanied by severe lancinating pain, coming in paroxysms like after-pains. This pain is due to the accompanying peritonitis. In the rare cases of pure cellulitis it is not a noticeable feature.

Vomiting is not present to any marked degree unless the peritonitis becomes general.

In portions of the country where malarial fevers are prevalent I have been led into an error of diagnosis by supposing to be bilious remittent what was really simple circumscribed pelvic cellulitis. By way of illustration: A woman who has borne several children falls into labor, and after two or three hours is delivered. Everything passes off in the easiest manner conceivable, and there is nothing to suggest the slightest injury to the genital canal. On the third or fourth day, however, there is a slight chill, followed by fever, which rises higher and higher on the second and third days of the attack, and declines afterward, under a treatment by quinine, to complete defervescence on the fifth day, running a course which I have demonstrated elsewhere[1] to be the typical course of bilious remittent fever, and which is almost identical with that of simple traumatic fever, whose thermometric range has been drawn by Billroth.[2] During such an attack the patient repeatedly denies the existence of pain in the pelvis. There is no decided tenderness on pressure over the abdomen, and no evidence of inflammatory exudation is at first observable on vaginal exploration. Three or four days after the subsidence of these symptoms it is perhaps observed that there is a return of fever in the evening, which declines toward morning and rises again in the evening, and is of decidedly remittent character. Matters thus progress until some time during the second week after delivery, when exudation becomes manifest in one of the broad ligaments, and a dull pain is felt in the same region. It now becomes clear that the attack was inflammatory in character from the beginning, and examination will usually reveal a laceration of the cervix on the side corresponding to the exudation. In many of the slight attacks the fever subsides on the fifth day: in these there will seldom be an appreciable exudation.

[1] *Amer. Journ. Med. Sciences*, April, 1881.

[2] *Surgical Pathology*, 4th ed., p. 330, translated by Hackley.

The exudation tumor is rounded in form, variable in size, seldom exceeding an apple in its dimensions, and situated between the layers of the broad ligament. The uterus is somewhat fixed, and pushed by the tumor to the opposite side of the pelvis. In some cases, after the lapse of a few weeks, the exudation becomes of almost stony hardness, and presents as much resistance to the finger as would an exostosis growing from the pelvic wall.

The exudation need not be limited to the broad ligament, but may extend to the pelvic walls, or even invade the iliac fossa, and form a large tumor easily discerned through the abdominal wall. In regard to these tumors Lusk[1] remarks that, "as the exudation between the broad ligaments may have been slight from the beginning, or may have subsequently disappeared by absorption, the iliac tumors have often apparently a spontaneous origin." Sometimes the exudation within the pelvis is so extensive as to give to the examining hand the impression that it has been freely poured, as it were, from above among all the viscera, and has solidified into one solid mass.

Some of these exudations are not sensitive at all, while others are very painful upon the slightest pressure. The amount of discomfort occasioned by the exudation will depend much on its situation. In one case the functions of the bladder will be greatly disturbed by the tumor; in another the rectum will suffer most; while in a third, the exudation being among the psoas and iliac muscles, extension of the thigh will be painful.

When the fever subsides the exudation begins to undergo absorption, and in a few weeks may entirely disappear. In other cases its removal is slow, and it remains as an indurated mass for many months.

The continuance of fever for five or six weeks generally means the formation of pus. The occurrence of suppuration is marked by acute pain in the inflamed part, by great sensitiveness of the exudation, by chills and evening fevers of high grade, and by night-sweats. Very soon fluctuation will be detected in the tumor, and the precise location of the pus can be fixed by exploration with the hypodermic needle.

According to Olshausen, the abscess, if left to itself, will generally discharge just above Poupart's ligament; next in frequency rupture takes place into the colon; rarely into the bladder, uterus, and vagina, and most rarely of all into the peritoneal cavity.

If we attempt a description of the clinical features of *non-puerperal* pelvic cellulitis, we shall find them differing in no material respect from those which characterize the puerperal form of the disease. Generally, the symptoms of the former are less severe and the exudation confined by more moderate limits. It must not be forgotten, however, that in acute pelvic cellulitis, whether puerperal or not, pelvic peritonitis usually

[1] *Op. cit.*

exists also. In such cases there are present intraperitoneal as well as extraperitoneal exudations. As stated by Lusk, "In suppuration of parametritic exudations the pus commonly forms in small scattered collections, and rarely gives rise to large abscesses."

In the non-puerperal form metrorrhagia is one of the earliest symptoms, yet, according to my observation, it is not peculiar to cellulitis, but belongs to periuterine inflammation in general.

It is quite common to observe cases in which there is no chill and little fever, but considerable pain. And, again, there is a class of cases which give no history of any febrile movement and complain of no pain. In these the patient is pale, weak, and somewhat emaciated. There is failure of appetite and digestion, with a sense of pelvic uneasiness and pressure, and a derangement of the functions of the bladder and rectum. Exploration of the pelvis then reveals a large mass of exudation not sensitive upon pressure.

Emmet[1] has called attention to a very distressing symptom, hard to relieve, which occurs as a sequel after the acute symptoms have passed away. This is irritation of the bladder, with a constant desire to urinate. The cases in which this symptom is most prominent are those in which the cellular tissue of the utero-sacral ligaments has been involved. As the inflammation subsides and the ligaments undergo shortening, the uterus necessarily becomes anteverted to an abnormal degree, and as the cervix is carried backward, direct traction is made on the neck of the bladder; hence the bladder symptoms. The physician, not understanding the cause of this irritation, perhaps resorts to injections into the bladder, which not only fail to afford relief, but hasten the occurrence of a cystitis.

To relieve this distressing symptom, and to aid indirectly in relieving the inflammation of the ligaments, Emmet has devised the now well-known "buttonhole" operation on the urethra.

Diagnosis.—The clinical history of periuterine inflammation is so variable that in a very large proportion of cases no conclusion as to diagnosis can be reached except by a study of the physical signs in connection with the circumstances under which the attack occurs. This study involves a complete knowledge of the subject of pelvic exudations.

The diseases which must be differentiated from pelvic cellulitis are pelvic peritonitis, pelvic hæmatocele, and uterine fibroids.

The differentiation from pelvic peritonitis is the most important and most difficult. I do not undertake to make a complete diagnosis between these diseases, but simply endeavor to present here and in the section on Pelvic Peritonitis such points as will aid us most materially in coming to correct conclusions.

[1] *Op. cit.*, p. 275.

We should bear in mind that as a result of exudation in the connective tissue there will be at first merely a surface of resistance, and later a firm, doughy, inelastic swelling of rounded outline discoverable in one or more of the following localities:

1. Between the cervix and bladder a small circumscribed inflammation or ante-uterine phlegmon which is excessively tender to the touch, of the same width as the cervix, and does not extend into the lateral culs-de-sac. The uterus is partially fixed. A patient under my care, while carrying an armful of wood, fell astride of a high doorsill in stepping over it, thus jarring, wrenching, and straining herself through the pelvis. She suffered severe pain, with retching and vomiting and distressing vesical tenesmus, and the exudation was as above described. Termination in resolution. Suppuration very rarely occurs, and the abscess, as in the case seen by Courty, empties into the bladder. This is the most rare of the phlegmons. Traumatism is the cause.

2. Between the cervix and the rectum, retro-uterine phlegmon. A circumscribed swelling, exquisitely sensitive on pressure, of ellipsoid shape, lying transversely behind the cervix, differing from small effusions into Douglas's pouch in its hardness and distinctness of outline, and situated at a higher level than the floor of this pouch. The uterus, not appreciably displaced, is in a manner fixed. There are pelvic pain and pain in defecation. Suppurating phlegmons here are rare. The two cases of Simon and Alph. Guérin have been previously referred to, and also that of Naudier, the last illustrating the fact that quite large abscesses may occur in this location. In the absence of an autopsy it would be perhaps impossible in such a case as Naudier's to say whether the effusion was in the cellular tissue or in the peritoneum.

3. Phlegmons of the parametrium proper, or of the lateral connective tissue at the junction of the broad ligaments with the uterus, form tumors which are of semilunar shape, extending from one side around the cervix into the cellular tissue between it and the bladder, or to the cellular tissue between the cervix and fossa of Douglas. These lateral phlegmons are to be distinguished from the peritoneal tumors on the sides of the uterus which have been demonstrated in the autopsies of M. Bernutz. The peritoneal tumors, which consist of encysted serous effusions and inflammatory adhesions behind the broad ligaments, from my observation, usually seem to be attached to the womb on one of its postero-lateral margins, and extend from about the level of the os internum to the uterine fundus or a little above it. They are most easily explored through the rectum after throwing the womb into a position of moderate retroversion; which can often be done, as its mobility is but partially impaired.

In addition to the above must be mentioned the exudations into the connective tissue of the folds of Douglas or utero-sacral ligaments.

The peritoneal covering of these folds is usually involved also, and the ligament sometimes becomes converted into a thick retro-uterine tumor.

4. As a result of inflammation originating in the parametrium the exudation may spread along the base of the broad ligament or along its upper part, or may involve all the connective tissue between its folds, thus forming in each instance a well-marked phlegmon[1] separated from the uterus by a distinct furrow. In all these cases the uterus is more or less fixed, and, if the tumor be of considerable size, is pushed to the opposite side of the pelvis. It is often difficult to differentiate this exudation from an encysted serous pelvic peritonitis behind the broad ligament and pushing it forward. In some cases the connective tissue of both broad ligaments, the entire parametrium, and the tissue of the utero-sacral ligaments are completely infiltrated with exudation-matter, forming a solid mass around the womb and rendering it absolutely immovable. Under such circumstances it will be *sometimes* observed that there is entire absence of fever and entire absence of pain or tenderness in the swelling; and we may be certain that, as a rule, where pain has been absent from the beginning there has been no involvement of the peritoneum. Fritsch[2] attaches great value for diagnosis to the painless origin of these swellings.

5. The tumors described under the foregoing heads are small, confined within the limits of the true pelvis, and do not rise above its brim. The inflammatory process may, however, after travelling between the folds of the broad ligaments, ascend into the iliac fossa and extend forward underneath the peritoneum, to point, in the event of suppuration, above Poupart's ligament; or, extending from the side of the uterus around the lateral margin of the bladder, it may invade the retro-pubic tissue and ascend on the anterior abdominal wall, involving the subperitoneal connective tissue as high as the umbilicus, and forming an abdomino-pelvic tumor, This tumor is chiefly abdominal, but presents at the pelvic roof, and can be easily aspirated through the vagina on the side of the bladder. It is not median in situation, but formed rather on one side or the other of the middle line.

In these cases, though the tumor does not descend into the true pel-

[1] A description by Dr. West (*Dis. of Women*, 3d ed., p. 423) of an autopsy made by him will assist the student in obtaining an idea of the composition and physical characteristics of phlegmons of the broad ligament. He says: "The appearances found after death explained this thickening and accounted for the non-mobility of the womb, for the folds of the broad ligament, from the upper part of the vagina to the lower surface of the ligamentum ovarii, enclosed a mass of dense cellular tissue of almost cartilaginous hardness, crying under the knife, dense white bands intersecting each other in all directions and having a firm yellow fat between them. This mass was closely adherent along the whole left side of the uterus, though the uterine tissue was in no respect implicated in it."

[2] *Op. cit.*, p. 272.

vis, we will expect to find evidences of inflammation near the uterus—that is, exudation-matter—and some fixation of that organ, and to have the antecedent history of labor or abortion.

Rarely, the phlegmons run their course without a symptom of peritonitis during life or a trace of it after death, as proven by a few autopsies. Often peritonitis, *to a moderate extent*, coexists with the phlegmon, but to so slight a degree that the attack is practically one of cellulitis. In severe attacks the two diseases usually prevail in nearly equal intensity. Then the diagnosis must be periuterine inflammation. Occasionally, a septic peritonitis destroys life in a few days without any involvement of the cellular tissue.

The strong points in favor of a tumor being due to cellulitis are its sequence upon labor or abortion or a surgical operation upon the cervix uteri; its appearance in one of the localities in which the cellular tissue abounds; its unilateral position; its comparatively painless origin; and its freedom from tenderness on pressure. These may be termed probabilities of diagnosis. In protracted cases there is a marked tendency in cellular tumors to suppurate; in peritoneal tumors, to monthly exacerbations.

Tumors which result from peritonitis alone occupy two positions. One of these is in Douglas's pouch, where it can be felt encroaching upon the vagina and rectum, and pushing the uterus forward and upward against the pubic bone. The second position is in one of the lateral positions called by Polk the "retro-ovarian shelves."

Absolute immobility of the uterus is often observed in connection with peritoneal tumors, while in cellulitis uterine mobility is less impaired.

Courty says that peritoneal tumors are "never indolent;" acute pain accompanies their formation, and they are very sensitive upon pressure.

(For further remarks on diagnosis the reader is referred to the section on Pelvic Peritonitis.)

Pelvic Hæmatocele.—An intraperitoneal hæmatocele could scarcely be confounded with pelvic cellulitis. It is difficult under some circumstances to differentiate a retro-uterine hæmatocele from a pelvic peritonitis in which there is an encysted effusion in Douglas's pouch; but the history of the case usually removes all doubts of diagnosis. Aspiration would not be advisable for diagnostic purposes.

It is only in the pelvic hæmatoma of Bernutz, or hæmatocele in which the bloody effusion has occurred in the connective tissue of the broad ligament, that the physical signs resemble those of pelvic cellulitis.

In this affection there is a history of abrupt invasion, sudden formation of tumor, without fever or symptoms of inflammation; the tumor is in the broad ligament, the anterior wall of which is bulging; the

tumor is at first fluid, and in a few days becomes solid; the uterus is fixed. After a time, when absorption has occurred, the base of the ligament is felt like a firm cord running out to the pelvic wall.

I have several times diagnosed such cases, and Emmet[1] has reported one in which the wall of the hæmatoma ruptured and blood was extravasated into the peritoneum.

Uterine Fibroids.—The tumor formed by an interstitial fibroid is one with the uterus, and cannot be separated from it by any line or furrow of demarkation. A subperitoneal fibroid growing from the posterior wall of the uterus, and pushing it against the pubic bone, might be confounded with a parametritic exudation. Fritsch[2] reports such a case in which the diagnosis was very difficult. When the truth was revealed by autopsy, instead of a parametritic suppurating exudation there was found a sloughing, incarcerated myoma of the posterior cervical wall. It must be remembered that large parametritic exudations behind the uterus are very rare.

Prognosis.—In discussing prognosis reference is here made not only to the probable course of the inflammation, but to its remote consequences. Both recent and chronic inflammations of the cellular tissue generally result in recovery. Both puerperal and non-puerperal cases cause anxiety in proportion to the prominence of the septicæmic symptoms. The inflammation may entirely disappear, and yet its results may be of the most baneful character.

Pelvic cellulitis may give rise to the following morbid conditions, which are oftentimes practically irremediable:

1. *Pathological Anteflexion,* the cervix being drawn upward and backward, and the fundus thrown forward. The uterus itself is drawn away from the pubes and nearer to the sacrum. As shown by Schultze, this is due, first, to inflammation; then resolution with cicatrization and contraction of the tissue between the peritoneal folds which constitute the utero-sacral ligaments. Thickening and resistance of the structures in the neighborhood of one or both of these ligaments are appreciable by the finger. Dysmenorrhœa, sterility, and obstinate cystitis frequently result from these changes in the ligaments.

2. *Lateral Version* is a result of cellulitis between the folds of one broad ligament. After resolution, contraction follows and the uterus is drawn to that side.

3. *Disorders of Menstruation: Amenorrhœa and Menorrhagia.*—Emmet has shown by analysis of his cases that menstruation remained normal in about 16 per. cent. only.

Other consequences have been ascribed to cellulitis, but they are for the most part attributable to the peritonitis which so often complicates it.

Treatment.—*Prophylaxis.*—The prophylactic treatment of a dis-

[1] *Op. cit.*, p. 233. [2] *Op. cit.*, p. 273.

ease which is generally considered to be for the most part of septic origin must practically consist in the rigid adoption of those measures which have been found to be most efficient in preventing the admission of poisonous germs from without, to the tissues which have been laid open by the injuries done to the genital canal during parturition, or by the knife of the surgeon in the various procedures of gynecology.

The strictest cleanliness must therefore characterize all obstetrical and surgical manipulations—cleanliness of the entire person of the operator and of his instruments and dressings; the avoidance of unnecessary examinations of the genital passages during parturition; the frequent ablution of the hands and bathing of the external genitals during labor with antiseptic solutions; and antiseptic irrigation of the vagina in gynecological operations.

The most thorough, rational, and efficient system known to us for obstetric cases is that which was introduced into the New York Maternity Hospital in 1883 by Dr. H. J. Garrigues,[1] and which is identical with that adopted two years later by the staff of the Boston Lying-in Hospital.[2] This method is based upon the theory of the bacteriologists, that the septic poison is not autogenetic, but that the germs are introduced from without. Its great value may be inferred from the fact that since its adoption the percentage of sepsis in the New York Maternity has been reduced from 6 to .21 per cent., while in the Boston Hospital a similar reduction has been obtained. A part of this system consists in the careful and accurate closure of perineal lacerations. "When we have secured complete primary adhesion in a recent wound, as a rule all danger from inflammation is at an end."[3] While the application of this principle is easy enough for lacerations of the lower portion of the vagina, it is surrounded by some embarrassments where the cervix uteri is involved. And yet in special cases where extensive cervical laceration has occurred it should be repaired in the same manner very soon after the termination of the labor.

This principle I have put to a practical test in a most conclusive case of extensive laceration involving the entire cervix on one side, extending upward beyond the os internum and laterally into the vaginal roof.[4]

Gynecological operations upon the non-puerperal woman should be conducted with the strictest antiseptic precautions.

Curative Treatment.—In the beginning of an attack of pelvic cellulitis the first indication of treatment is to relieve pain and bring about

[1] *Antiseptic Midwifery*, by H. J. Garrigues, 1886.

[2] "Antiseptics in Obstetric Practice," by W. L. Richardson, *Boston Med. and Surg. Journ.*, Jan. 27, 1887.

[3] *Internat. Encyclopæd. of Surgery*, "Inflammation," vol. i. p. 140.

[4] *Miss. Valley Med. Monthly*, Dec., 1884, "An Important Point in the Prevention of Pelvic Inflammation after Delivery."

reaction as quickly as possible. Both these objects will be accomplished by the administration of opium and the external application of heat. If the attack be of moderate severity, the opium may be given by the mouth or rectum in doses sufficient to relieve pain; and its use should be judiciously continued as long as the patient's comfort actually requires it. The good effects of heat are best obtained by the application to the abdomen of flannels wrung out of hot water. These should be renewed as often as they become cool, and at the same time copious hot-water vaginal injections may be administered.

Absolute rest of body and mind should be secured from the beginning, and should be continued until convalescence is established.

In cases of great severity there are usually decided chill, and, as the peritoneum is involved, acute pain. The pulse rapidly rises to 120 and upward, and the clinical thermometer registers 104° to 105° F. The patient is in great distress. Under these circumstances prompt and active treatment is demanded. The pain should be relieved by hypodermic doses of morphia. The temperature should be reduced to near the normal by proper doses of antipyrine. As the tendency in such cases is to a continuance or to a return of high temperature, the two other antipyretic agents, cold and quinine, may be required. After the temperature has been reduced by antipyrine, quinine, in full doses by the stomach or by the rectum, is of decided value, especially in those cases marked by decided remissions.

The two objects to be aimed at are the relief of pain and the maintenance of a nearly normal temperature by the use of one or all of the antipyretics combined. To accomplish these will require unremitting attention for days. Meanwhile, the patient should be nourished by liquid food as well as the stomach will permit.

After the fever has subsided the most important work to be accomplished is removal of the exudation. The successful accomplishment of this depends upon a proper performance of the nutritive functions; hence the condition of the digestive organs must be carefully observed. From time to time, calomel in one-grain or half-grain doses, given once in three hours to the extent of three or four grains, will be of great value in modifying the secretions and in acting as a safe aperient. For the relief of the gastric catarrh and other symptoms of impaired digestion so common in febrile disorders, I have often used before meals a teaspoonful or less of an alkaline powder composed of equal parts of the phosphate of lime, subnitrate of bismuth, and magnesia. This aids digestion and generally secures a daily movement of the bowels. Emmet recommends five grains of inspissated ox-gall three times a day.

When convalescence begins the patient should be fed as liberally as her digestive powers will allow, and these will be greatly aided by tonics, among which the citrate of iron and quinia may be mentioned as

especially useful. Opium may be required in small doses for a considerable period. It should, however, be discontinued as soon as the patient's condition will allow it.

For hastening the absorption of the exudation a blister across the hypogastrium will be of decided value. This may be repeated in ten or twelve days if circumstances require it.

The hot vaginal douche, as recommended by Emmet, is of great value in stimulating the removal of inflammatory products.

In cases which are disposed to assume a chronic character repeated blisters are called for; and we may derive much benefit from the use of the wet bandage around the hips and abdomen. It should be covered with rubber cloth and worn continuously day and night. It lessens internal congestions and relieves pelvic pain and soreness.

Should the system fail in its efforts to accomplish removal of the exudation, a new train of symptoms will arise, indicating the formation of pus.

Pelvic Abscess.

Etiology.—Pelvic abscess in women is for the most part the result of some one of the forms of periuterine inflammation which have been described in the preceding pages. It is true that now and then a collection of pus is found in the female pelvis, as in the male, in consequence of an inflammation of the bones which enter into the formation of the sacro-iliac symphysis. Such a collection may also result from the extension of a psoas abscess, or it may originate in the cellular tissue between the rectum and sacrum in consequence of traumatism, or as a result of those textural changes which are so ready to occur, in depraved conditions of the blood, in the cellular tissue of any portion of the body. The collections of pus here alluded to are, however, of rare occurrence, and we shall not be far from right in declaring that, practically, pelvic abscess in the female is directly traceable to two causes—1st, pelvic peritonitis; 2d, pelvic cellulitis, or else to both these inflammations combined.

In any given case it will usually be an easy matter to prove that the abscess has resulted from an inflammation which had its beginning in or near the uterus. This will be made evident by the history of the case, by fixation of the uterus, and by the presence of exudation-matter located near it and extending continuously to the seat of the abscess. There need not be continuity of suppuration from the uterus to the abscess. The uterine lesion may originate an inflammation which will be propagated along the lymphatics to the lymphatic ganglia remote from the uterus. The connective tissue around these ganglia may then become inflamed, and thus the abscess is formed at some distance from the uterus.

In addition to these purulent accumulations in the pelvic cellular tissue and peritoneum there are several others which require mention only in this place. These are—

1st. Pyosalpinx, which sometimes forms a distinct tumor.

2d. Abscess of the ovary, which as a separate and distinct affection is occasionally met with in the non-puerperal woman. It is supposed to be of very rare occurrence, and is probably caused by long-continued ovarian irritation the result of some form of uterine disease, such, for example, as fibroid growths. Mr. Henry Morris,[1] Mr. C. J. Cullingworth,[2] Mr. Lawson Tait,[3] and Dr. Emmet[4] have recorded cases.

3d. Abscess of the uterus or circumscribed abscess in the walls of the uterus has been recorded by Scanzoni, Schroeder, and others.

In destructive puerperal inflammations which involve all the tissues of the pelvis it is not very uncommon to find an abscess located in the uterine parenchyma. Dr. Robert Barnes[5] says the abscess does not originate there, but may be traced to "foci formed in the venous tissues or lymphatics, whose walls are first inflamed by the reception of septic matter from the cavity of the uterus." Outside of this condition it is questionable if abscess of the uterus is ever met with. Mr. Tait[6] has, however, described a case which he diagnosed as such in a non-puerperal subject after exposure to cold. The purulent collection was at the base of the bladder, intimately associated with the uterus and movable with it. After the cervix had been dilated by a tent the uterine cavity was found to be filled with pus, and the finger detected on the anterior uterine wall, just within the cervix, a soft spot with an aperture in its centre. The patient recovered.

Pathological Anatomy.—*Intraperitoneal accumulations* of pus exceed in pathological importance all other pelvic abscesses for the following reasons: They are of common occurrence, often of large size, cause profound disturbance of the nutritive functions, and, surgically considered, are usually very difficult of access. In some instances they show but little tendency to empty themselves, and may be carried by the patient for an indefinite period.

If rupture occurs, it may be into the peritoneum, and give rise to a rapidly-fatal peritonitis; or else into the rectum, and cause an exhausting and uncontrollable diarrhœa; or it may lead to the formation of extensive fistulous tracts, which are always difficult to close and sometimes entirely beyond the reach of surgical art. Dr. Matthews Duncan said in 1868: "I regard intraperitoneal purulent collections as forming the majority of the grave abscesses in this situation."

The intraperitoneal abscess has a cavity of indescribable shape, with

[1] *Brit. Med. Journ.*, May 21, 1881.
[2] *Lancet*, Nov. 3 and 10, 1877.
[3] *Diseases of Ovaries*, 4th ed., p. 125.
[4] *Op. cit.*, p. 651.
[5] *Med. and Surg. Dis. of Women*, 1874, p. 439.
[6] *Diseases of Women*, p. 64.

numerous pouches or processes running in different directions. Its walls are composed of false membranes, of coils of intestine, of perhaps the sigmoid flexure and rectum, and of the broad ligament on one side. In its centre, as Aran states, there is generally found one of the uterine appendages or the ovary and tube of one side.

The most important feature of peritoneal abscesses is that at some point within the abscess-cavity we are quite sure to have the Fallopian tube distended with pus. Here, then, is an abscess within an abscess. Although the abscess proper may be evacuated by rupture or the knife, a cure is delayed: the *fons et origo mali* is not destroyed. This I believe to be a great difficulty in the way of bringing about the closure of these cavities.

Coming next to consider *abscesses of the cellular tissue*, it may be stated that wherever this tissue abounds suppuration may occur, and may extend from its point of origin throughout the pelvis. Pus will extend in the direction of the least resistance. The influences which guide its extension are the planes of fasciæ and the course of the lymphatic vessels, which are the chief poison-carriers. The pus is often not confined in a single cavity, but the abscess is multilocular.

Dr. Thomas Savage[1] states that these abscesses have burst or been opened in order of frequency—1, in the iliac region; 2, above the pubes, nearly as high as the navel; 3, in the inguinal region; 4, by the side of the anus; 5, by the vagina; 6, by the rectum; 7, into the bladder; 8, into the peritoneum.

According to Winckel,[2] from an analysis of 24 cases of puerperal pelvic cellulitis of his own and 13 by Veit, suppuration occurred in 6. He quotes König as saying that opening under Poupart's ligament was the most frequent course; sometimes through the abdominal wall above Poupart's ligament; then into the rectum; then into the bladder and vagina; while that into the uterus, through the perineum, greater sciatic foramen, into the peritoneum, and alongside the quadratus lumborum muscle, are equally rare.

As to the frequency of *abscess of the broad ligament* discrepancy of opinion exists. Thus, Courty[3] says that abscess of the broad ligament is common. Dr. W. H. Byford[4] says: "The most frequent locality of pelvic abscess is between the layers of the broad ligament." On the other hand, Dr. Matthews Duncan[5] says that abscess of the broad ligament "is very far from common," and that "the broad ligaments are not parts in which inflammation and abscess are likely to take their origin." He alludes to the fact that the pus between the layers of the

[1] *Op. cit.*, 1870.
[2] *Op. cit.*, p. 209.
[3] *Op. cit.*
[4] *Trans. Amer. Gynecolog. Soc.*, vol. viii. p. 209.
[5] *Op. cit.*, p. 29.

broad ligament, described in puerperal autopsies by old physicians, was not in an abscess, but in the veins or lymphatics.

Dr. Thomas Savage, in his work on the *Anatomy of the Female Pelvic Organs*, whilst recording the forms and localities of 20 cases of pelvic abscess, mentions only 2 in which the broad ligament was the seat of the abscess. In 1 of these there existed a uterine fibroid. Peritonitis and death resulted from rupture of a large abscess of the broad ligament. In the second case a uterine polypus had been removed by the ligature. Death followed rupture into the peritoneum of a large abscess of the broad ligament.

Dr. D. Berry Hart[1] remarks: "There is little doubt that we can have a cellulitis of the broad ligament, and that it may go on to abscess of the broad ligament. This I have seen in a case of abdominal section by Prof. A. R. Simpson, where the existence of pus distending the broad ligament was verified by the aspirator passed in from above."

From my own observation I would say that abscesses of the broad ligament are far from common.

Some pelvic abscesses have their origin in extraperitoneal hæmatoceles or hæmatomata in the cellular tissue of the broad ligaments. This has been proven by Mr. Tait's operations, in which the abscess wall was chiefly formed at the expense of the posterior layer of one of the broad ligaments. The floor of the abscess-cavity was organized blood-clot; the contents were fetid pus and decomposing blood-clots.

The evacuation of the contents of an abscess frequently fails to result in a cure. In the event of rupture into the rectum or bladder there may be an almost uninterrupted discharge of pus through either of these cavities for months. In a case under my care the purulent accumulation was on the right side of the pelvis, and rupture occurred into the rectum. The patient refused all manner of surgical assistance, and the discharge of pus through the rectum continued with slight interruptions for four years.

The explanation of such cases is to be found in the facts that the opening is often oblique or indirect, and is not so situated as to completely empty the abscess-cavity; the walls have become thickened and otherwise changed; granulations do not form and the adhesion of opposing surfaces fails; moreover, one of the diseased uterine appendages remains to keep up the inflammation. Fistulous canals result. This leads us to consider—

The Structure of the Walls of Abscess-Cavities.—The lining membrane of acute abscesses, wherever they may exist, consists simply of true granulation-tissue, such as we see covering the surface of a wound which is undergoing the process of healing. The abscess-cavity is obliterated partly by the formation of granulation-tissue, and partly

[1] *Atlas*, plate xxii.

by the adhesion of opposing granulation-surfaces. To secure obliteration of this cavity complete evacuation and continued drainage are required, and if the cavity is a large one a healthy condition of the nutritive functions is also essential.

According to Agnew,[1] the encapsulating wall of a chronic abscess differs from that of the acute only "in thickness, strength, and development." . . . . "Much of the inflammatory transudation is organized into connective tissue, so that this wall becomes a fibrous sac, sometimes of great thickness." . . . . "The exterior of this wall or sac is irregular, bristling with prolongations which interpenetrate the surrounding parts, while the interior has a villous or granular appearance, the eminences consisting of loops of blood-vessels buried in transudation-corpuscles. These vessels are the source of the leucocytes which form the pus of the abscess, the connective tissue, at least in several localities, playing a very subordinate part in its production."

Dr. William H. Byford[2] of Chicago has made a very interesting contribution to our knowledge of the changes which take place in the walls of the cavities of some chronic pelvic abscesses. Dr. Byford says: "At first the inner wall of the cavity is covered with the healthy granulations of an ordinary ulcer, and in every respect resemble those observed in external ulcerations. After an indefinite time they degenerate and disappear, when patches of cicatrization result, and in the end the whole cavity is lined with a cicatricial membrane. With the loss of the granular character of the inner surface no more pus is produced. The lining of the wall is no longer covered with granular eminences, but it is a smooth, shining membrane of cicatricial organization. This membrane is then of the simplest organization, and possesses the properties of exosmosis and endosmosis. The cavity is kept in a state of repletion by exosmosis, and sometimes grows by an excess of serum thus effused; generally, however, an equilibrium in these two processes maintains stationary dimensions in the tumor thus resulting."

Dr. Byford thinks the changes here described explain the origin of some of the cystic tumors of the abdomen and pelvis which have been reported by Dr. George H. Bixby.[3] He was cognizant for a number of years of the progress of two of the tumors alluded to in Dr. Bixby's article.

This author goes on to state that "the lining of the walls of the chronic abscesses does not speedily undergo the changes thus described; but from it may be found depending masses of granulations, giving rise to tag-like projections in great numbers, from the twentieth of an inch to half an inch or more in length. In all instances in which I have observed these projections they have proved too fragile to be con-

[1] *Principles and Practice of Surgery*, vol. i. p. 105.

[2] *Trans. Am. Gyn. Soc.*, vol. viii.

[3] *Ibid.*, vol. i.

sidered fibrinous exudations, and have possessed all the properties of aggregated granulation-masses. They are fungoid and easily broken down and removed by the finger or dull curette."

Diagnosis.—The diagnosis of pelvic abscess involves the recognition, first, of an inflammatory exudation in the pelvis, and secondly, of the occurrence of suppuration.

Pelvic exudations are usually associated with a well-marked history of periuterine inflammation. They have already been discussed in this connection in the preceding sections. Sometimes, however, the exudation process is a *cold* one throughout its entire history; the usual symptoms of inflammation are absent; the patient is at no time confined to bed; a large tumor fills the pelvic cavity; and then for a time the diagnosis may be obscured. In some instances the tumor thus formed is easily confounded with a uterine fibroid.

The occurrence of suppuration in sthenic cases is marked by rigors and fevers of the hectic type, the temperature rising high in the evening and subsiding after midnight with a sweat. There are also added increased pain in the swelling and fluctuation.

In other cases no such symptoms arise. Weeks pass by. The patient suffers but little, yet convalescence does not occur. The exudation-mass, instead of slowly melting away, remains unchanged or perhaps increases in extent. Fixation of the uterus continues. The appetite does not improve. Nutrition steadily fails. Careful examination with the thermometer now reveals a slight increase of the bodily temperature above the normal, and the physician is thus led to suspect the occurrence of suppuration. Still, fluctuation may be inappreciable; and this is especially apt to be so if the effusion is above the pelvic brim and intraperitoneal. Careful exploration by the finger of the roof of the vagina will, however, in all probability, lead to the discovery somewhere of a soft spot, through which the needle of a hypodermic syringe may be carefully passed so as to explore the tissues beyond. Thus, the diagnosis will usually be made clear.

The hypodermic syringe, when intelligently used, furnishes us a perfectly safe means for the exploration of pelvic abscesses.

Abscess of the ovary is so rare, and so little is known of its clinical history, that its recognition can scarcely be expected.

The diagnosis of pyosalpinx will be discussed in its proper place.

Prognosis.—Pelvic abscess in every case presents a situation more or less grave. Intraperitoneal abscesses are usually high in the pelvis —indeed, are partly abdominal in their location; are difficult to reach by surgical measures; and even after their contents are evacuated a sac may remain which, unless properly drained, will continue to discharge pus for an indefinite period.

Abscesses of the cellular tissue, as a rule, admit of a more favorable

prognosis. If situated low down, as in the inferior portion of one of the broad ligaments, or if located in the iliac fossa or in the tissue of the anterior abdominal wall, a cure may readily be obtained by incision and drainage.

Rupture of the abscess upon a cutaneous surface or into the vagina, with free discharge, is favorable to speedy recovery, but rupture into the bladder or rectum is not desirable.

Nonat declared that when the abscess "opens simultaneously into the intestine and bladder, death is almost inevitable." Dr. Thomas has emphasized this statement, and corroborated it by the results of a case under his care.

TREATMENT.—Although some modern gynecologists, like Aran and Becquerel, and very recently Prof. Fritsch of Halle, have taught that these abscesses should not be interfered with, but left to Nature—that is, to burst into the vagina, the bladder, or the rectum—I know of no good reason why they should not be treated, like abscesses in other parts of the body, in accordance with the general principles of surgery.

As stated by Howard Marsh,[1] "it may be laid down as a general rule that pus is to be removed as soon as it is formed. In cases of acute abscesses this rule may be considered very nearly absolute. We have now at our disposal the means by which the serious complications that were formerly met with as the result of putrefactive changes may be avoided, and the withdrawal of pus has a very beneficial effect in abating the severity of acute inflammatory processes."

In the application of this principle to any given case our conduct will be governed by the situation of the abscess, by its character whether acute or chronic, and by the condition of the patient.

As has been clearly emphasized by Sir Jas. Y. Simpson and Prof. T. Gaillard Thomas, no rule can be given which will hold good in every case of pelvic abscess. The safety of the patient may in one instance demand early evacuation of the pus; in another it may make delay the proper course. Grave constitutional symptoms, high fevers followed by heavy sweats, certainly justify, as Bernutz said, an almost dangerous operation for the relief of the patient.

In most instances perhaps reasonable delay is the better course, because the abscess will then have an opportunity to become ripe; the separate accumulations of pus which are often found in the connective tissue will then have coalesced, and a thinner wall will intervene between the pus and the surface to be incised.

It is true that while we wait the abscess may break in some disagreeable direction; but it is also true, as Aran declared, that there are cases on record of spontaneous rupture into the peritoneum or intestine several days after artificial puncture.

[1] *Internat. Encyclopædia of Surg.*, vol. ii. p. 268.

As illustrating the danger of leaving the disease to Nature, mention may be made of the 24 cases of pelvic abscess reported by McClintock[1] which were thus treated: 13 of these were puerperal and 11 were non-puerperal. Four of the patients died from rupture of the abscess into the bowel and an uncontrollable dysentery which followed; 3 others died of rupture into the peritoneum. A heavy mortality!

Means for the Evacuation of Pus.—1. *The Knife.*—The proper instrument for the evacuation of a pelvic abscess is the knife. The presence of pus being ascertained, and its situation being favorable for an incision through the roof of the vagina, the patient is to be etherized and placed on her side. Sims's speculum having been then introduced, a grooved director or exploring-needle is pushed into the abscess-cavity at some point as remote as possible from any pulsating vessels which may be discovered. As soon as pus appears in the groove a tenotomy-knife is to be passed along the director, and the opening enlarged by cutting in opposite directions until it is capable of admitting the index finger.

After introducing the finger into the cavity any partitions which may be felt are to be broken down. A full-sized drainage-tube should then be introduced, and secured in position by stitching it to the vaginal wall. Through this tube the cavity may be washed out every day or oftener by a gentle stream of pure water, or the water may be made stimulating and disinfectant by a solution of the bichloride of mercury, 1 : 4000, or of Lugol's iodine somewhat diluted.

If exploration by the finger shows the presence within the abscess-cavity of those fungoid masses which Dr. Byford has described, they should be carefully and thoroughly removed, as recommended by him, either with the finger-nail or by means of the dull curette. This measure he found beneficial by lessening the amount of discharge, by destroying the offensive odor which is present, and by hastening the closure of the cavity.

The abscesses favorably situated for this plan of treatment are the suppurating hæmatoceles and other purulent collections in Douglas's pouch, the parametric abscesses behind the uterus, and those which point at the base of the broad ligaments. Iliac and abdominal-wall abscesses which seek an opening on the cutaneous surface are to be approached by careful division of the tissues on a director, as in the operation for laparotomy.

In using the knife for making incision through the roof of the vagina the operator should bear in mind the dangers of wounding large venous plexuses as well as arterial branches which ramify through the connective tissue. He should also be mindful of a deplorable accident which has sometimes occurred, and which can hardly be foreseen: the

[1] *Op. cit.*

ureter may be opened and a uretero-vaginal fistula result. Two such cases have come under the observation of Dr. Emmet, who states that an abscess beneath the folds of the broad ligament may drag the ureter of that side up to the level of the vagina at a point one inch above and the same distance behind the point of entrance of the ureter into the bladder, and may attach it by adhesions to the vagina. It is then in a position to be injured by the knife in opening the abscess. In one of the cases referred to an operation for relief failed, and in the other it was successful only through the great skill of the operator and the fortunate circumstance that the urine from the kidney on that side could be turned into the bladder through the tract of the old abscess.

Paquelin's cautery-knife may also be used for making the incision through the roof of the vagina instead of the ordinary knife.

Many pelvic abscesses are so situated that the plan of treatment just described is wholly inadmissible. Quite often the pus-cavity is high in the pelvis, the vaginal roof is thickened by false membranes, and the pelvic organs are drawn so closely together by an adhesive peritonitis that the abscess cannot be approached through the vagina at all. For this class of cases the proper means of relief is to be found in the operation of *abdominal section*, as proposed and successfully practised by Mr. Lawson Tait. This method offers a means of cure to a large number of cases which cannot be successfully treated in any other way, and which have hitherto resulted in death or hopeless invalidism.

Alluding to the history of chronic pelvic abscess as given by Dr. West, Mr. Tait says:[1] "In my own practice such disappointing cases have occurred with but too great frequency, and though I have had some successes by the employment of such means as the elastic ligature and counter-opening in the vagina, yet the progress toward recovery has been so protracted as to contrast favorably only with those cases in which there was no recovery at all. I have been therefore continually on the outlook for some means of dealing with such cases which would bring them as satisfactorily within our means of treatment as are collections of matter in most other parts of the body. This has been furnished by the wide, free, and successful application of abdominal section for the treatment of pelvic and abdominal tumors, and I have now to lay before the society six cases, which include the whole of my experience in this novel proceeding, and in which success has been obtained far surpassing anything I have yet seen or heard of."

Mr. Tait offers this as a means of treatment for all purulent accumulations in the pelvis which cannot be safely opened from below, and he recommends that in case of doubt an exploratory abdominal section be first made. The cases which he has successfully treated thus are pyosalpinx, acute purulent peritonitis from rupture of distended tubes,

[1] *Diseases of the Ovaries*. 4th ed., 1883, p. 346.

abscess of the ovary, abscesses in the upper part of the broad ligament, and suppurating hæmatoceles. In his fifth case the cavity of the abscess was formed by the lifting up of the posterior layer of the left broad ligament. The rectum was carried up in front of this, together with the large vessels of both sides, as high as the bifurcation of the aorta, whilst anteriorly the peritoneum dipped to such an unusual depth that had he tapped through the vagina the trocar would have gone through the peritoneal cavity to reach the abscess.

After the abdominal incision is made and the purulent accumulation brought into view, it is aspirated; then a free incision is made into the abscess wall, and its edges are carefully stitched to the edges of the abdominal wound. A drainage-tube of glass or rubber is then inserted, and the cavity is daily washed with plain water.

In some cases the abscess wall is adherent to the abdominal wall in front. In such the treatment is more simple—evacuation of its contents and drainage. In other cases the accumulation of pus is small and is deep down in the pelvis. Here the work inside the abdomen will consist in separating the attachments of adherent viscera and in ligating and removing the diseased appendages. While doing this the abscess-cavity may be ruptured and its contents discharged into the peritoneum. The pus should then be carefully taken up by sponging, and the pelvis washed scrupulously clean with warm water and drained.

Mr. Tait has now operated in this way a great number of times, and his example has been followed by other surgeons with varying success. He says:[1] "My general conclusion from these cases is that the opening of such abscesses by abdominal section is neither a difficult nor a dangerous operation; that recovery is made in this way more certain and rapid than in any other; and that in future I shall always advise an exploratory incision where I am satisfied there is an abscess which cannot be reached nor emptied satisfactorily from below."

Occasionally the disease we are considering assumes a form which in all its clinical aspects very closely resembles the last stage of pulmonary consumption. There is great emaciation, profound anæmia, and dropsical swelling of the lower extremities. Along with a rapid pulse and fever of a remittent type and profuse sweating, there is constant pain, which necessitates the daily and nightly use of opium. The pelvic roof is hard and resistant, and in places greatly thickened. Though no distinct tumor may have formed, the symptoms indicate that suppuration has long since occurred, and it is not difficult to find one or more collections of pus. This may be evacuated by the trocar or aspirator, but not even temporary improvement will follow, because the relief is only partial, and the entire cellular and peritoneal tissues of

[1] *Op. cit.*, p. 351.

the pelvis are involved in inflammation. For such cases abdominal section and drainage may be proposed as a last resort.

2. *The Aspirator.*—This beautiful contrivance has been recommended by some surgeons as a safe and certain means for the cure of abscesses which are seated high up in the pelvis and so surrounded that they cannot be readily reached through the vaginal roof by the knife.

Dr. G. H. Lyman[1] has presented an interesting contribution to this subject in the shape of a report of 41 cases of pelvic abscess treated by himself and colleagues in the Boston City Hospital. In some of these cases the abscess was evacuated by a trocar, the canula of which was left in as a drainage-tube, or else some other means of drainage was used; but 17 cases were treated by aspiration alone—that is, by simply emptying the cavity with the aspirator, without washing or injecting it in any way. Of this number, 10 were reported cured; 4 were not benefited; 1 was improved only; 2 were injured. In 4 cases serum, clear or bloody, was removed by the aspirator. In 3 of these no improvement followed, while the fourth was cured.

In regard to these cases I would remark that the results reported are probably too favorable, for the following reasons: It is almost impossible to learn the subsequent history of this class of patients. One of these cases, as shown by the report, was discharged from the hospital while remnants of exudation were still recognized in the pelvis. Some remained only a few days after the operation, one being discharged five days after aspiration, another thirteen, another fourteen days. The report cannot, therefore, be considered conclusive in regard to the question of cure.

A knowledge of the pathology of abscess, of the structure of the walls of chronic abscesses, and of the almost invariable presence of diseased uterine appendages in peritoneal collections, must convince us that the cure of the disease is rarely to be obtained by aspiration. When the purulent accumulation has been withdrawn by the aspirator, clots of blood, sloughs of connective tissue, and shreds of lymph too large to pass through the canula are usually left behind, either to continue the suppurative process, or else, in all probability, to furnish the exciting cause for those "residual abscesses" which Mr. Paget[2] has shown are often "formed in or about the residues of former inflammations. Most of them are formed when pus produced long previously has been wholly or in part retained and become dry or in some form obsolete."

In one of my cases treated by aspiration there was, in connection with a large serous accumulation in Douglas's pouch, a collection of pus in the cellular tissue of the pelvis and the anterior abdominal wall. The patient did well for many months, but a year afterward a large accumulation suddenly formed in the pelvis without appreciable cause

[1] *Trans. Am. Gyn. Soc.*, vol. vi. [2] *Clinical Lectures and Essays*, 2d ed., p. 309.

and without complaint of pelvic symptoms, with all the signs of septicæmia, rapid pulse, high temperature, and delirium, and terminated fatally in a few days. My conclusion was that this inflammation had its origin in a residual abscess. Just before death a quart of fluid was withdrawn by aspiration, the first and far the greater portion of which was deep straw-colored serum; the last, thick, bad-smelling pus.

My own experience with aspiration in the treatment of pelvic abscess has been far from satisfactory as a curative measure, and in several cases, though large amounts of pus were withdrawn, there has not followed even temporary relief.

I believe that the use of the aspirator should be restricted almost entirely to purposes of diagnosis and to the evacuation of those chronic serous effusions which persist in spite of all other treatment. Safe as aspiration may seem when properly performed, it is not devoid of danger. If the needle be thrust into a hæmatocele by mistake, instead of an abscess, violent inflammation and death may ensue, as in Case VI. of Dr. Lyman's report; and Dr. Thomas quotes a case from the *Boston Medical Journal* in which air entered the veins during aspiration and the patient died in ten minutes.

Whenever resorted to, aspiration should be practised with strict antiseptic precautions.

Treatment of Sinuses.—It is not unfrequently the case, when the patient first comes under observation, that the abscess has already discharged itself through one or several openings, and as many separate sinuses remain. If there be several openings, it is a matter of importance to ascertain whether they all communicate with each other and acknowledge a common source. To pass a probe from one of these openings—on the cutaneous surface, for example—through a circuitous route, and make it emerge at another, cannot often be done. But by injecting iodine diluted, or some other colored fluid, into one of the openings, it will appear at all the others if a communication exists.

Various expedients have been devised for the closure of these sinuses. The principle which underlies them all was proposed by Sir James Y. Simpson in his *Clinical Lectures on the Diseases of Women*, and his remarks on the treatment of pelvic abscess are well worth a careful study now.

The vagina is the most desirable channel for the evacuation of a pelvic abscess. Simpson proposed, when the abscess has discharged itself at some other point and a sinus remains, that a counter-opening should be made in the vagina. His plan was to pass a large probe or sound through some opening above the pelvic brim down into the pelvis, until its point was felt by the side of the womb in the upper part of the vagina. Then, cutting upon this as a guide at the most dependent point of the abscess-cavity, a counter-opening was made. The open-

ing in the vagina may then be enlarged by the knife or a dilator, so as to admit one or two fingers for purposes of exploration.

If the abscess should have opened into the bladder or rectum, instead of upon the cutaneous surface, the proper means should be adopted for finding the opening into these cavities and passing through it the large probe until the locality for the vaginal counter-opening is made clear. If this is impracticable, we may, as Dr. Byford suggests, aspirate the vaginal wall with a view of finding the old abscess-cavity, and then cut with the bistoury upon the aspirator as a guide.

A drainage-tube of glass or rubber being introduced, the daily washing out of the cavity with warm water, made stimulating and antiseptic with iodine or Labarraque's solution of chlorinated soda, will in some cases bring about a cure.

In many cases no place can be found for making this counter-opening. If the patient's condition is not bad, and the sinuses are small and discharge but little pus, their closure may be accomplished now and then by the application to their walls of a strong tincture of iodine. In other cases, where the patient's health is seriously impaired and this plan proves ineffectual, resort to abdominal section, removal of diseased appendages, and drainage will become necessary.

Finally, during the surgical treatment of these conditions attention must be paid to the general health, and we must invoke the aid of tonics and stimulants, of fresh air and sunshine. These are the general principles involved in the treatment of pelvic abscess. While many cases will be thus successfully treated, others will tax to the utmost all the resources of surgery, and some will prove entirely beyond the reach of our art.

PELVIC HÆMATOCELE AND HÆMATOMA.

By ELY VAN DE WARKER, M. D.,
Syracuse, N. Y.

Nomenclature.—The term "hæmatocele" is based by Bernutz, the author of the word, upon the hypothetical resemblance of the peritoneal cul-de-sac of the female pelvis to the tunica vaginalis of the male, and is used to define a collection of blood in the pelvic excavation within the peritoneum. Bernutz limited the term to hæmatic collections due to hemorrhage from the internal genitalia.

Most authors exclude pelvic hemorrhage caused by rupture of extra-uterine gestation-sacs, of aneurismal tumors, ovarian cysts, or blood-effusions due to accident or injury. Some exclusion is necessary, as the term hæmatocele does not define a disease, but only a result that may be the outcome of various conditions. In order to give the term clinical significance, hæmatoceles of pelvic origin, in the absence of a better word, must be arbitrarily limited to certain well-defined sources of hemorrhage. With this view the limits imposed upon the term by Nélaton are adopted in this article. Nélaton restricted its meaning to a definite pelvic location by the word retro-uterine. As the hæmatic collection is not always located in the sac of Douglas, the term *pelvic* hæmatocele, first used by McClintock, is by far the better one, and is now in general use.

To be a true pelvic hæmatocele, to carry out the hypothetical analogy between pelvic peritoneal duplicatures and the tunica vaginalis, the blood must become encysted within the pelvis. Although a true cyst never encloses the effused blood, as good an authority as McClintock divides pelvic hæmatocele into two groups—*encysted* and *non-encysted;* which division has gained currency as defining the incarceration of the blood-mass by adhesions of contiguous peritoneal surfaces.

Some of the terms qualifying pelvic hæmatocele have led to confusion, which has resulted in confounding two distinct pelvic conditions. Nélaton brought into use the terms *circumuterine* and *peri-uterine hæmatocele*, which are now frequently employed to designate a pelvic hæmatoma. As it is important to make a careful distinction between hæmatocele and hæmatoma, the terms ought to be abandoned. Gallard, who

made frequent use of the terms, employed them without reference to the peritoneal relations of the effused blood. If we have made no other advance since Gallard wrote (1857), we ought to have gained precision in the use of terms.

While McClintock divided hæmatoceles according to the condition of the effusion, others have based the classification upon either the source of the hemorrhage or its anatomical relations. Génouville makes two groups—the catamenial and the accidental; but here, in order to group a case, it is necessary to define the source of hemorrhage, which is in many cases impossible. Barnes makes an elaborate classification of two groups and five sub-groups, and writes of it as though it was a material addition to our knowledge of the subject. Barnes has, however, added a very expressive word—cataclysmic—to describe large and sudden effusions attended by alarming or fatal collapse. Excluding rupture of the parturient uterus and of tubal gestation-cysts, which Barnes includes in this sub-group, hemorrhage of a cataclysmic character belongs to a diseased ovary, rupture of the pampiniform plexus, or of the subovarian vessels.

Great confusion obscures the relations of hæmatocele to hæmatoma, and, although the terms express two very different classes of pelvic hæmatic tumors, the words have been used by good authors as synonymous. Such terms as hæmatocele ligamenti lati (Bandl)—and which, according to Nélaton, are small blood-effusions in the broad ligaments which are very common and mild in their course—Huguier's pseudo-hæmatocele, and Gallard's circumuterine and periuterine hæmatocele, have added useless confusion to the nomenclature of a difficult subject. If we add to this confusion of terms the fact that writers who have shaped opinion upon this phase of pelvic pathology have denied the existence of extraperitoneal effusions of blood in the pelvis, except in connection with gestation and the puerperal state (Bernutz), and when, granting the possibility of such effusion, we have applied the term thrombus (Meadows), we are able to form an idea of the status of hæmatoma as a distinct symptom of a pelvic condition. Notwithstanding the authority of Bernutz and Meadows, the term thrombus ought never to be applied to an extraperitoneal effusion of blood, but restricted in its gynecic sense to blood-exudations of the external genitalia. When upon the subject of hæmatoma the term will be confined to this condition.

By the term hæmatoma we describe an effusion of blood between the folds of the broad ligaments or in the connective tissue surrounding the uterus and vagina, and which is now clearly recognized and differentiated from hæmatocele. Hæmatoma is without the peritoneum; hæmatocele is within the peritoneum; and upon this simple declaration this article will be based.

Hæmatocele.

History.—Poncet states that in the works of Hippocrates pelvic hæmatocele is clearly described, but from that period down to 1674 no reference is found to the disease until that year, when Ruysch of Amsterdam accurately described the menstrual variety of hæmatocele, proving the escape of blood outward through the Fallopian tubes into the peritoneal cavity, anticipating Bernutz one hundred and seventy-four years. In Hufeland's *Journal* (1818) another case of this variety is described. P. Franck in 1823 added other facts to our knowledge of the subject, but to Bourdon, a follower of Récamier, belongs the honor of first describing the physical signs of hæmatocele, demonstrating its encysted character and placing the lesion in the periuterine cellular tissue. Bernutz published his first memoir upon the subject in 1848, the beginning of a series of memorable papers. Viguès in 1850 based his observations upon seven cases, described the effused blood as extraperitoneal, and explained the source of the hemorrhage as ovarian. Nélaton in 1851 first gave the disease a status in literature, describing the tumor, its signs, and treatment, from which, in its essential features, there has been no departure to this day. In the French Academy in the same year a memorable discussion took place upon a paper by Monod describing a retro-uterine hæmatocele. Nélaton, Robert, Huguier, Denouviliers, Lenoir, took part in the discussion. Robert established the declaration of the pelvic regions involved in the effusions, the most important of which was the broad ligament, while Huguier enunciated his anatomical classification of intra- and extraperitoneal which endures to this day. Here, also, the treatment by puncture was first proposed, and was twice made by Denouviliers. In the thesis of Prost in 1854 the distinction of extra- and intraperitoneal was firmly settled. He first gave the physical signs of depression of the uterus in intra- and its elevation in extraperitoneal blood-effusions.

To English literature Tilt has given the most elaborate contributions (1853), but the condensed, graphic narrative of McClintock has had more influence upon the course of opinion. In 1855, Langier demonstrated the ovary as the source of blood-escape with its histological alterations. In the same year Gallard rendered a valuable service by passing in review the literature of the whole subject to his date, and reduced to order the fragmentary mass of facts. In this year also Peuch (de Toulouse) made a material contribution by demonstrating the several sources of hemorrhage, as lesions of the tubes, the ovaries, and the ovarian venous plexus. In 1858, Voisin published the most complete monograph yet offered upon the subject, and may be said to have concluded the period, one of the most brilliant in French medical history.

In Germany the period of literary activity coincided in date with that in France. The first cases of note were described by Herzfelder (1856), and by Credé (1857), Heyer, Breslau, Ulrich, Braun (1860), Krieger, and Ott (1863). In the works of Schroeder, Beigel and Olshausen, and Klebs valuable references may be found. The views of Virchow, that the hemorrhage is due to the rupture of neo-membranes within the pelvis, have gained ascendency in Germany. Many of the above notable papers are found in the files of the *Monatschrift für Geburtskunde*, so rich in gynecic literature during the formative period in Germany.

In England, besides the important contributions of Tilt and McClintock, we have those of Madge, Snow Beck, Meadows, Duncan, Simpson, and in the works of Hewitt, Bennet, Churchill, Tait, and others.

In America, although the subject has been well understood, but little original work has been done. Bedford in 1855 was among the first to make a material contribution; Byrne followed in 1862 with a very valuable monograph; C. C. Lee and Harrison are also later authors of excellent papers; while the more recent American textbooks—notably those of Thomas and Emmet—have given liberal space to the subject. From these beginnings the literature of hæmatocele and hæmatoma has assumed grand proportions. An examination of the material upon the subject in the library of the Surgeon-General's Office at Washington, as enumerated in the *Index Catalogue*, shows four hundred and fifty-five titles.

Causes.—Hæmatocele and hæmatoma are, for the purpose of description, regarded as diseased entities. They are, however, merely symptoms, and as such must be studied in their causative relations.

There have been marked and intimate relations traced between hæmatocele and ovarian function, and in consequence age has a direct bearing upon the liability. Voisin shows that the ages between twenty-five and thirty-six years define the period of greatest frequency. The ratios of those attacked at twenty-one years and at forty correspond. Schroeder's observations, based upon forty-three cases, confirm those of Voisin.

Concerning the relative frequency of hæmatocele authors differ so widely that no conclusion can be reached. Thus—

Hugenberger	reports	2	in 3801	cases.
Seyfort	"	66	" 1272	"
Olshausen	"	34	" 1145	"
The latter, again,	"	29	" 769	"
Bandl	"	5	" 1500	"

Scanzoni in twenty-eight years' practice met with hæmatocele only eight times. Barnes in his paper read before the Obstetrical Society of Lon-

don astonished his audience by the frequency with which he met with the accident, and upon this assertion alone Meadows openly attacked the correctness of his diagnosis.

This wide divergence in experience may be explained by the statement that observers who base their ratios upon hospital records meet with hæmatocele less often than those who are engaged in consultation-work. Hæmatocele is usually very sudden and severe in its onset, and is more often a domiciliary than a hospital case.

The reproductive age at its period of greatest activity being the period most prone to attack, substantiates the theory that many writers adhere to, that the ovaries and their essential accessories, the tubes, are the parts commonly concerned in the morbid conditions that result in hæmatocele. Voisin observes that the greater number of hæmatoceles occur near or at the end of the menstrual period, and when the hæmatic accident takes place menstruation ceases or is lessened in amount. This may be true as a clinical observation, but is not made clear by Bandl's explanation that the frequent development of hæmatocele during menstruation is due to the high blood-pressure in the ovarian vessels, from which, having been weakened by morbid changes, they give way. The general high-tension condition of the circulation that characterizes the menstrual process is greater at the beginning of the function, and the inference is clear that this ought to be the period of greater liability. Tilt substantiates this idea, as hæmatocele presents itself in two opposite conditions—namely, in the total absence of menstruation, and when it is morbidly profuse (menorrhagia). In the absence of the discharge the hemorrhagic loss attending the formation of the hæmatocele would supplant the menstrual discharge.

Bernutz and Tilt are the most determined advocates of the menstrual origin of hæmatocele. Tilt concludes his book on *Uterine and Ovarian Inflammation* by the rather dogmatic statement: "The occurrence of hæmatocele is one of the penalties of allowing the menstrual function to be habitually morbid." Such positive statements must not lead to the conclusion that hæmatocele is ever due to a functional derangement of the ovaries. Such has been the theory advanced, but there is no evidence to prove a vicarious origin, in the absence of organic lesion, of the pelvic accumulation. Tyler Smith takes this view, and supports it by the clinical fact that the hæmatocele is frequently augmented by renewal of the hemorrhage at each menstrual period; but, while the fact must be admitted, its explanation is not a logical one. Bernutz's theory is a better one, that it is a morbid excretion from the tube and uterus, but only a portion of the discharge is so effused, as in this variety (metrorrhagic hæmatocele) there is always an external discharge of blood at the same time.

Bernutz makes four clinical groups. The first is comprised of hæma-

tocele occurring in eruptive fevers and febrile conditions (purpura, black jaundice); second, all those cases that attend flooding after childbirth or abortion; third, hæmatoceles of metrorrhagic character symptomatic of pelvic peritonitis: this last is purely a theoretical group, difficult if not impossible to differentiate; the fourth group is characterized by some cachexia or observed in women subject to floodings.

Courty states that four sources of hemorrhage have been demonstrated by autopsy. They are as follows, in the order of frequency: Apoplectic hemorrhage from the ovaries; hemorrhagic pachyperitonitis; rupture of one of the vessels of the ovarian plexus; and, lastly, tubal hemorrhage (rupture). The latter source has given origin to the theory expressed by Lee, Poncet, Raciborski, and others—and to the truth of which a few demonstrations attest—that the inner surface of the tubes will secrete blood at a menstrual period like the endometrium. If the uterine extremity of the tube is closed, the blood will escape at the fimbriæ, and thus cause a retro-uterine hæmatocele. If the abdominal opening of the tube is also closed, a hæmatosalpinx is formed. In case such a tube is ruptured, hæmatoma, rather than hæmatocele, is formed. Barnes makes four sub-groups: 1, early Fallopian gestation and escape of ovum into the peritoneal cavity; 2, mechanical impediment to the escape of menstrual blood; 3, interrupted or disturbed menstruation from (*a*) cold, over-exertion, (*b*) emotion, (*c*) excessive sexual intercourse; 4, hemorrhagic tendency induced by disease, among which may be mentioned jaundice in pregnancy and excited by strong emotion or physical shock.

Bernutz says that a large and important class of hæmatoceles is the result of a defect in the relation of the tube to the ovary. If any such source exists, it must be the result of pelvic peritonitis causing adhesions, with distortion of either the tube or ovary in their relation to each other. But there is no post-mortem evidence of the fact. Madge gives importance to ovarian apoplexy as a cause of hæmatocele. A small blood-vessel gives way in the ovarian capsule, and a blood-extravasation occurs, with a gradual augmentation month by month until the ovarian stroma is ulcerated (ulceration of ovary). At last the capsule ruptures, and the blood escapes into the pelvic cavity. Monthly hemorrhages then take place from the ovarian stroma, with a corresponding periodic increase in the pelvic accumulation, with all of the attending signs—pain and shock—of hæmatocele. The case is nearly a hopeless one, but at any of the periodic exacerbations does not present specially alarming symptoms. This theory explains in a very perfect manner the case reported by Madge.

Richet, Dévalz, Scanzoni, and Winckel assign to a varicose condition of the subperitoneal venous plexus of the ovary and tube an important etiological relation to hæmatocele. Scanzoni believes the condition is a

rare one; Winckel, however, figures it very beautifully in his *Die Path. Weiblich. Organe* (pl. xxvii. figs. 2, 3), and states that this varicose condition of the ovarian venous plexus is frequently met with in post-mortem examinations.

Bandl mentions rare cases of hæmatocele in which around the uterus and in the labia a varicose condition of the veins was observed. There is no doubt that a varicose condition of the parovarium has been found associated with the accident. Bernutz also says that a varicose dilatation of the pampiniform may occur in both the pregnant and non-pregnant, and when carried beyond a certain limit may rupture. A hæmatocele due to this cause ought, from the suddenness with which such a rupture would occur and the abundant source of the hemorrhage, to be catastrophic, as Barnes terms it.

It was first asserted by Virchow, and reaffirmed by Dolbeau, Huguier, and Tardieu, that the blood-effusion may be limited to the peritoneum (peritonitis hæmorrhagica), and explained by Virchow as a process similar to that which occurs in pachymeningitis pseudo-membranosa, in which a like exudate is noticed. It is evidently the same process to which Bandl gives the name of pelvi-peritonitis hæmorrhagica. The same idea has gained the good-will of Bernutz, who regards the exudate as the homologue of that in the hemorrhagic pleurisy of Laennec. A hæmatocele due to this cause ought to present some differential characters in marked contrast to those present in a hæmatocele due to sudden rupture of a pelvic vessel. In the latter the pain and peritonitic symptoms follow, and in the former the peritonitis ought to precede the effusion. This, clinically speaking, is just what does not occur. While it cannot be denied that effusions, such as are here described, may be the result of peritoneal inflammation of a certain grade in any situation where the membrane may be met with—while, in fact, exudation may be said to be a general attendant of the inflammatory process in the part—still, we cannot regard it as a common cause of the hæmatoceles that concern the gynecologist. It is difficult to conceive of a pelvic effusion justly due to the latter cause that could reach such a point in its development that it would be clinically proper to cease to regard it as a peritonitis, and become simply a hæmatocele. Exudative pelvic peritonitis, in which the effusion is organized into vascular pelvic adhesions, may lead to hæmatocele—not, however, as the result directly of the peritonitis, but as the outcome of the adhesions. The rupture of vascular adhesions may take place and lead to a very active intrapelvic hemorrhage. This accident is especially liable to happen if old uterine displacements are replaced with the sound or with an instrument known as a repositor, which has now, fortunately, gone nearly out of use. It is a common matter, after a forcible replacement of a distorted or displaced uterus, for a pelvic mass to quickly form, attended with

severe pain and rapidly-developing peritoneal tenderness. In the course of several weeks or months the mass is gradually absorbed, and the pain and tenderness in like manner subside. Such a case is usually considered as a new, or as a relapse of an old, cellulitis. In our present knowledge of the subject of hæmatocele it is certain that many of these cases ought to be considered instances of this accident. Abdominal surgery teaches us that the rough handling of peritoneal surfaces adherent with old adhesions is not specially liable to cause a renewal of inflammation. With this experience before us it is philosophical to class some cases of this character as hæmatoceles.

Emmet holds that the theory of Bernutz, that menstrual blood may regurgitate through the tube backward into the peritoneal cavity, worth no more than a passing notice; but he admits that Trousseau's theory, that the source of the hemorrhage may be in an exhalation from the mucous membrane of the tube, may be correct, the blood coming from that portion near the fimbriated extremity. Meadows, in commenting upon this theory, gives the opinion that in an ordinary state of the tube such a thing is not possible, but that it must be granted that the tube is dilated, and its contents forced toward the fimbriæ, causing the spasmodic pain characteristic of the menstrual variety of hæmatocele. Tait, without any qualification, says the theory is improbable. Very few demonstrations bearing directly upon the subject are recorded, and in both cases of undoubted regurgitation mentioned by Brodie and Pauly there was occlusion of the os externum uteri.

Several cases have been recorded of dilatation of the tube in instances of double uterus. Decès relates a case of double uterus and vagina, with the left vagina imperforate, with accumulation of menstrual blood in the left uterus and vagina. It resulted in over-distension, rupture, and death.

Barnes has a group of hæmatocele due to the prevention of the escape of uterine discharges during abortion. In these cases the blood is forced along the tubes, and finds its outlet into the peritoneum. No cases have been discovered which substantiate this theory. Such a condition may be possible in traumatism due to forced abortion, but even here, from the necessary condition of things, we can barely admit its possibility.

Spencer Wells states that blood may effuse from the stump of an ovarian cyst when treated intraperitoneally. Small effusions from this source are very common, and the symptoms slight. When the pedicle is secured externally, blood has been observed to percolate from its exposed extremity at a menstrual period. By a parity of reasoning, we may assume that the same condition may occur when the pedicle is treated intraperitoneally, and thus small menstrual hæmatoceles be formed. It is doubtful if a hæmatocele due to this cause would, clinically, call for rigid diagnosis.

Frequent mention is made by many authors, especially of the French school of gynecology, of sexual intercourse at a menstrual period as an etiological condition. Seven cases out of ten mentioned by Voisin had the first pains attending the accident occur during coitus. Bandl records a case in which coitus first took place at the beginning of menstruation, attended by the rapid formation of hæmatocele. Puech also cites a case. We can readily admit what a potent factor sexual intercourse at a menstrual period may be as a cause of rupture of impaired pelvic blood-vessels. Too frequent or too violent a sexual act is also mentioned as an exciting cause; but if any cases are directly referable to this cause, they have escaped demonstration.

Severe bodily effort during menstruation has been known to precipitate an attack of pelvic hemorrhage. Heavy lifting, dancing, or long pedestrian excursions ought to be carefully avoided by one at this period who has ever been subject to a menstrual hæmatocele. Sudden chilling during menstruation, especially of the extremities, may act as an exciting cause. Bathing the feet in cold water at such a time has been known to be the apparent cause of an attack.

Changes in the constitution of the blood or in the walls of blood-vessels after acute exanthems are sometimes the cause of pelvic accumulations of altered blood. Bandl names purpura, icterus gravis, scarlatina, and variola as the diseases in which pelvic peritoneal affusions are the more liable to occur. Trousseau calls the hæmatocele thus associated the cachectic. In a strict classification of etiological conditions this cause ought to be excluded. The morbid condition may, and probably does, extend to the general peritoneal cavity of the abdomen, and the blood accumulates in the pelvic spaces by gravitation. Clinically, a hæmatocele due to this cause would rarely claim the attention of the gynecologist.

We have thus gone over all the pelvic and general conditions which may act as near or remote causes of this serious accident: a great many are rarely acting factors; others, however, are so frequently observed that ordinarily, without going into any method of rigid exclusion, we may say that the lesion exists in the circulatory plexuses of the ovaries and tubes. We are justified in saying that the ovaries are periodically in a condition favorable to the accident. As Rokitansky states from actual demonstration, a source of ovarian hemorrhage may exist in a bursting of cysts of the ovary formed of distended follicles in which blood has been extravasated—a condition, minus the rupture, observed with great frequency in the cadaver. It is not difficult to understand why the menstrual group of pelvic hæmatoceles is the one with which the gynecologist has most frequently to contend.

Pathology.—Since retro-uterine and anteuterine hæmatoceles rarely terminate fatally, many of the early pathological conditions

are obscure and are largely obtained from clinical study. Time is not measured by its ordinary periods in gynecology, and the year 1859, when Simpson wrote upon hæmatocele, while near in the matter of years, is remote in view of the rapid advance of a great science; and yet, crowded as is the intervening time with facts, nothing has been added to the truth as he expressed it, that "there is almost no limit to the variety of the situations in which a pelvic thrombus or a hæmatoma may be found, for the veins may give way in any part of the pelvis, and the blood which escapes may fill sometimes one facial loculament only of the pelvis, at other times several at once." Snow Beck says that the arrangement of the fascia in the pelvis covering the various muscles, and converging to a central part at the neck of the uterus, is very complicated, and often presents a weak point behind the os internum, into which the finger can be pressed and through which a hernial protrusion of the veins may occur. This was the seat of an effusion observed by him. There are other and less complicated reasons why the hæmatic affusion is generally noticed in the recto-uterine pouch. The Fallopian tubes are always directed backward, never forward, so that a blood-effusion naturally takes the direction downward and backward. Periuterine and anteuterine hæmatoceles are usually secondary to retro-uterine hæmatocele, or when anteuterine hæmatocele exists without the retro-, it is because Douglas's space is obliterated by adhesions and fibrous bands, so as to prevent the accumulation at this point. A case recorded by Schroeder demonstrates this fact. While, however, the ovaries and tubes lie mostly in the posterior wings of the broad ligaments, and the escaping blood most easily finds its way into the recto-uterine duplicature of the peritoneum, it is a mistake to suppose that all blood so effused will do this if this cavity is free. Small blood-masses will become entangled in the vesico-uterine pouch or even lie above the broad ligament. These are marked exceptions to the rule, which may be said to hold true when Douglas's space is free.

Courty says that if the hemorrhage comes from the tubes or ovarian venous plexus, the resulting hæmatocele may be limited to the folds of the broad ligament, or under the peritoneum covering the uterus, in periuterine cellular tissue, not only behind and in the broad ligament of the other side, but also in front under the peritoneal fold covering the uterus and bladder. These limits of the hæmatic tumor define the hæmatoma rather than the hæmatocele, and the disposition of the blood affused into one broad ligament to pass over to the other develops the central constriction in the tumor, to which considerable importance is given in the differentiation of the two forms of pelvic effusions.

Emmet defines three sources of hemorrhage. The first is from the mass of vessels known as the bulb of the ovary, from which the blood would pass into the peritoneal cavity; second, from the pampiniform

plexus and network of vessels under the tubes and between the folds of the broad ligaments, and thus the escape would occur in the cellular tissue or, by rupture of the peritoneum, pass into the cavity of the abdomen; third, from the vaginal junction at bottom of Douglas's space, at the point described by Snow Beck, or from some point in front of the uterus, but outside of the peritoneum, from which point the effusion would be confined to the cellular tissue. The first source of hemorrhage would, generally speaking, give origin to the menstrual variety of hæmatocele, and the second and third to the forms usually found associated with childbirth or abortion. Most frequently the extravasation of blood into the pelvic cellular tissue, known as hæmatoma, results from rupture of the pampiniform plexus or the venous anastomoses of the broad ligaments, and not from the ovaries. Rupture of the vessels in the vaginal roof is generally due to traumatism, such as forced abortion or pelvic operations.

The ovaries have been found degenerated and partially converted into soft, dark-red capsules capable of pouring out considerable quantities of blood, and in this form associated with retro-uterine hæmatocele. In the section upon Cause a varicose condition of the venous plexus of the ovary or broad ligament has been noticed—a condition found in child-bearing women, and of which a varicose condition of the labia majora may be taken as a type. If in these cases the peritoneum were to give way a hæmatocele would result; and, on the contrary, such rupture of the vessels has been observed with the peritoneum intact, with hæmatoma as the result. Nélaton believed that blood might escape spontaneously from the ovaries during menstruation.

In over-exertion during menstruation blood can escape from the corpus luteum in certain morbid states of the organ. Apoplexy of the ovary, mentioned by Scanzoni, may possibly be a condition that would favor hemorrhage from the organ in the condition last mentioned. The case on which his theory of apoplexy is based is not of that character. In the instance of an eighteen-year-old girl who died from a rapid pelvic hemorrhage, the section showed the right ovary the size of a hen's egg, with a large blood-cyst in the posterior wall, in which was a rupture one inch long, through which the blood had escaped. Blood-thrombi in the connective-tissue stroma, usually quite small, or small cysts, are not rarely observed. Bandl gives to these important pathological value.

The tubes, aside from rupture due to over-distension, are sometimes subject to changes which may result in hemorrhage. Occlusion of the uterine extremity of the tube has been observed. Barlow reports such a case where the tube was distended with the clot protruding from the ovarian extremity. Scanzoni mentions a like case, with the tube distended to the size of the finger, holding two ounces of blood, while

sixteen ounces had escaped into the peritoneal cavity. Bandl roughly generalizes that when the ovary is normal the pathological change is located in the tube. The reader is now prepared to realize that no such broad generalization can be made—that, as a matter of fact, if the ovary is normal the source of hemorrhage is usually found in some of the numerous venous congeries of the uterus or broad ligament. Vigués has stated that every hæmatocele is caused by a tubal pregnancy. Gallard also adheres to this theory. Hæmatocele very frequently follows a two months' lapse of menstruation, and often after a recent delivery. Frequent childbearing is associated, either as a cause or a result, with narrowed and dilated tubes. As a further proof of this theory, tubal moles or blighted ovum have been noticed. In some cases a decidua has been found. There are several cases of extra-uterine mole pregnancies on record. Prof. Heschl placed a typical instance of this at Bandl's disposal, preserved at the Vienna Pathological Museum. Two other cases of like nature have been preserved, while Duverney also described a case. The fact that tubal pregnancy can cause, and unfortunately has caused, pelvic hæmatocele of a catastrophic character permits no kind of doubt, and, from possessing altogether another kind of interest to the gynecologist foreign to this subject, has been excluded as a cause from this article. It is a matter of direct interest to the subject that this form of pregnancy may result in a mole and be a source of danger for an indefinite time. We must regard it as placed beyond a doubt that this termination has taken place, and has not placed the subject exempt from dangers which are regarded as the direct and certain outcome of tubal pregnancy with normal development of the ovum. Destruction of the ovum by electricity, with a mole degeneration of the blighted product, may be a result of the use of this very certain way of arresting fœtal growth.

Courty considers the anteuterine variety of hæmatocele secondary to the retro-uterine. If the recto-uterine pouch is too small to contain the effusion, both varieties will form. G. Braun notes a case in which a tumor 15 cm. long developed in the utero-vesical space. The bladder was forced downward and backward in the vagina. On examination after death peritonitis was marked; a sac as large as a child's head occupied the anteuterine space; behind and below it was bounded by the ligamentum latum and the uterus, on the left by the mesentery and sigmoid flexure, in front and above by the adherent small intestines, mesentery, and the greater omentum. Braun remarks that after adhesions of the extent and character noted a large space was left in the region of the utero-vesical space that could be occupied by a hæmatocele. Schroeder examined a like instance in which the rupture of a tubal pregnancy gave origin to an anteuterine hæmatocele. Douglas's space was obliterated by strong adhesions which confined the uterus

backward. Schroeder's idea was that the adhesions of the uterus with the rectum, and the resulting displacement backward of the organ, were primary to the formation of the hæmatocele, thus causing a large space to be occupied by the extravasated blood in the anteuterine region. Reasoning from the great frequency with which adhesions and consequent obliteration of Douglas's sac are observed, we must admit that it is a very probable antecedent of hæmatocele. Given this condition, there is but one other pelvic space that could be occupied by any considerable blood-accumulation. While we admit a periuterine peritonitis may be primary to any pelvic effusion, it certainly does not afford grounds for the broad generalization that the extensive adhesions that encapsulate the hæmatic tumor, and give origin to the name of hæmatocele, are always a condition that exists prior to the pelvic hemorrhage. Schroeder is inclined to this view of the matter, while Braun also expresses the same opinion in the case quoted from him. Nélaton says that the formation of the blood-tumor is the primary, and the peritonitis with pseudo-membrane and adhesion of near parts the secondary, steps in the process. The argument, on the other hand, that experiments with animals by injecting blood into the peritoneal sac do not result in exciting peritonitis and encapsulation of the foreign blood-clot by adhesions, is not valid, and furnishes no grounds for a like conclusion in the human subject, in which we have to deal with a morbid process from the beginning to the end of a pelvic hæmatocele. In the human subject we have not alone the blood-clot, but an altered state of the secretions, a lowered vital tone incident to the hemorrhage, and the primary tissue-changes which made the entire series of morbid events possible. These conditions can never obtain in animal experiments. We must come to the conclusion that the peritonitis and adhesions which form such a striking phenomenon in true pelvic hæmatocele are the results of the pathological conditions which have their origin in the pelvic blood-accumulation with its primary morbid tissue-alterations. This conclusion must, however, be modified to the extent of admitting that a pelvic peritonitis with adhesions and distortion of the pelvic organs may precede the occurrence of pelvic blood-accumulation, but that such a condition is a coincident, and not in any way a link, in the chain of diseased sequences related to the hæmatocele, except as the previous existence of the pelvic inflammatory process may favor the occurrence of rupture of some pelvic blood-vessel. A more careful study of the hæmatic sac affords additional evidence of the truth of this argument.

Generally, quite rapidly after the formation of the pelvic clot, symptoms of peritonitis develop. If, in a week to three weeks after, a post-mortem examination is made, the clot is found surrounded by a false membrane, which has been mistaken for peritoneum. This pseudo-

membrane throws out filamentous prolongations which pass through the mass, while other extensions from it resemble bands of connective tissue and pass through the clot like partitions. In other instances no fibrinous bands of adhesions are formed, but a membranous-like covering spreads over the blood-mass. In other cases the enveloping process consists in a welding together of intestinal loops. An instance of this has been described above in relation to a case of anteuterine hæmatocele.

In retro-uterine blood-collections the following boundaries are usually noticed: The broad ligaments and the uterus are above and in front, behind is the rectum with the contiguous peritoneum, below the utero-rectal pouch, and above it is bounded by agglutinated loops of small intestine. In cases of retro-uterine hæmatocele with a well-defined history of antecedent pelvic inflammation the following boundaries were observed by Voisin: Below the recto-uterine pouch, above the broad ligament and the sigmoid flexure, and sometimes the small intestine. These cavities are of a great variety of forms—sometimes winding, sometimes ovoid with inter-opening spaces—and have a capacity of one-half pint to five pints.

The contents of the sac of the hæmatocele present quite a uniform character, according to the stage at which it is observed. In its early history it is simply blood, which rapidly undergoes changes. At first it acquires a greater consistency, due probably to a loss of a portion of its serum by absorption, and of a tar-like color. At a later stage Huertaux found (1) drops like oil of a brown or yellow color; (2) spherical cells, entire or reduced to fragments, abounding in adipose nucleoli; (3) amorphous fragments of hæmatoidin; (4) quadrilateral crystals resembling ammonio-magnesian phosphate; (5) some blood-globules darkly stained; and (6) a great quantity of blackish corpuscles resulting from altered blood. In other instances the tar-like blood is largely mixed with pus and sanies. Rindfleisch found in the contents serrated and shrunken blood-corpuscles, rarely any fresh, numerous white blood-corpuscles or pus-globules, with epithelial and granular cells.

The pelvic hæmatoma differs totally in its surroundings from the hæmatocele. In some instances the peritoneum is stripped off from the underlying parts and the space occupied by the extravasated blood; in others, as in the duplicatures of the broad ligament, two peritoneal surfaces are wedged apart by the blood-mass; while, again, the cellular tissue affords space for the extravasation. From the nature of these surroundings the hæmatoma is always of less extent than the hæmatocele, and as a rule unattended with adhesive peritonitis and the agglutination of the near parts. If found associated with obliteration of pelvic peritoneal spaces by adhesions, that condition is probably a prior matter to the development of the hæmatoma. The displacement exerted

by the hæmatic tumor upon contiguous organs also differs from that of the hæmatocele, which will be noticed later when upon the subject of differentiation of the two conditions.

Changes in the contents of a hæmatoma are less rapid than in hæmatocele. It is difficult to explain this, unless it is done by the assumption that the blood is more effectually sealed from septic influences external than internal to the peritoneal sac. Of course the marked peritonitis that attends the hæmatocele may add both rapidity and malignancy to the changes that take place in the contents of the latter. Altered blood, sanies, pus, are found that do not materially differ from those already described. When the extravasation is situated between the folds of the broad ligament, adhesion to near parts has been observed, but not to the same extent as in hæmatocele. Silvestre found in the right ligamentum lata a cavity filled with blood which communicated with the cavity of a thrombus behind the uterus. The peritoneal surfaces were changed by the deposit of lymph and injected vessels. This example shows that these pelvic blood-tumors may coexist, and probably have their origin at the same time, while their cavities may communicate. Clinically, it would be impossible to form any opinion as to this coexistence. Such a condition may occur more frequently than the isolated case of Silvestre would give grounds to believe, as the extensive massing together and alteration of the tissues would render the recognition of the complication difficult if not impossible.

An instance of hæmatoma of the ovary was submitted to the writer by Dr. C. E. Billington, a coroner, for opinion. The specimen was taken from a woman thirty years old, who had died after a suspected criminal abortion. The uterus was about four inches long, its walls thickened, soft, and the inner layers of its parenchyma deeply injected, with evidences of fatty degeneration. The right ovary had upon its upper surface a cyst as large as a pigeon's egg, covered by the peritoneum on the outer one-third of its surface, and the remainder of the circumference embraced by the structure of the organ. It was filled with dark coagulated blood. There were evidences of general peritonitis, but no mention was made of pelvic adhesions. The affusion was but a few days old, judging from the appearance of the blood-clot, which was quite fresh. While, in our present knowledge of the subject, we could not regard the hæmatoma as an evidence of forced abortion, the assumption is proper that it was the result of violence to the pelvic organs. If this sac had ruptured while the hemorrhage was in progress, it would have been an example of a hæmatoma passing into a hæmatocele.

Poncet states that in old sacs the contents become partly organized with bands of false membranes and strata of fibrin, resembling the condition of old aneurismal sacs. This condition is rare.

Emmet says that if the term is confined to blood-accumulations in the peritoneal cavity, the disease is a rare one, but if held to embrace all blood-accumulations in the pelvis, the disease is more common than is generally supposed. It is frequently mistaken for a pelvic cellulitis. Escape of blood in small amount into the connective tissue may be like an attack of cellulitis in suddenness of symptoms; and, on the other hand, such small cellular effusions may exist without symptoms. Emmet has detected large accumulations going on in the peritoneum without causing the patient any discomfort. Cellular effusions of this minor character are more frequent midway in the menstrual life, especially in those who have borne a number of children in rapid succession. That the hæmatocele may exist without marked symptoms and without pathological traces is not to be doubted. Barnes says that the remains of slight pigmentation in Douglas's sac are very frequent, assuming, of course, that such appearances indicate the presence of old effusions.

There is yet a wide field for study in the pathology of these interesting accidents. On many points we are yet in doubt. There has been too much theory and too little demonstration of actual conditions. Upon no subject have there been more voluminous contributions made of learned speculations, and yet so little actually settled.

Symptoms and Course.—McClintock makes three symptomatic groups: First, the severe, the cataclysmic of Barnes; second, the more moderate seizures, though plainly marked; and third, the chronic form —the symptoms being developed gradually and in succession, and being liable to be confounded with pelvic abscess or ovarian tumors. The marked symptoms belong to the initiative stages and attend the extravasation of blood. The symptoms of the first group are, first, the shock of pain and blood-loss; second, the reaction; third, the inflammation. The attack opens with a severe and sharp pelvic pain, generally well localized, but sometimes diffused over the abdomen. Associated with it is a more or less profound shock, the features pinched and blanched, the expression anxious, the pulse rapid and thread-like, the surface bedewed with cold sweat. In this condition the patient is found. For the first day, about in the following order, we would notice that the abdomen was distended; the least movement would cause more or less violent pain; vague shiverings or absolute chill; fever to 102° to 104°; pulse small and concentrated, from 100, 120, to 140 per minute; nausea, at times vomiting, sometimes uncoercible; the face continues pallid, expression anxious; the flesh soft and flabby. She rarely loses intelligence, and coma is extremely rare. The position is dorsal, avoiding all movement. After about the first twenty-four hours, these extreme evidences amend; the nausea and vomiting cease; the pulse loses its frequency, but is still above the normal; the face is less pinched, but

is still thin, and has a cachectic look, like that in malignant tumor. The pain is frequently of a neuralgic character, and sometimes of desperate intensity. In one case mentioned by Poncet the pain was in the right side, the anus, the thigh, the heel, and would then transfer itself without apparent cause to the opposite side, and then again shift in succession to its former points, as is sometimes seen in the evanescent pain of hysteria. In spite of most active treatment the pain will persist for two, three, or four days. The bad general condition, the profound anæmia, and the excited mental state tend to prolong the neuralgia, and render it resistant to all treatment. As this neuralgic condition is a feature of the attack prior to the introduction of the pain that is characteristic of the inflammatory stage, it is probably due to the blood-loss and the intrapelvic pressure, and gradually subsides as the system becomes adjusted to the loss of blood and the nerves habituated to the pressure of the pelvic mass. Due importance will be given to intrapelvic pressure when we reflect that in no other accident to which woman is liable can such a pelvic mass be developed so rapidly. This profound nervous disturbance causes yet further phenomena which prove its far-reaching character. The intestinal strangulation which has been noticed has by some been explained by the compression of the tumor upon the intestines; but it has been observed, too, soon after the effusion, before the coagulation of the blood and before the onset of inflammation, to be explained as the result of pressure. Poncet has for it a better explanation, regarding it as due to paralysis of the muscular layer of the intestines, and calling it pseudo-strangulation.

A very common form is attended with a monthly exacerbation of the symptoms. There are increase in size of the abdomen, tenderness on pressure, pain, and febrile reaction, defecation difficult and very painful. This periodical renewal of the attack has been explained by a return of the hemorrhage at each period, and defines the menstrual variety of pelvic hæmatocele. When the tumor is large we generally have vesical tenesmus or micturition is difficult, so that the catheter is necessary. Hart and Barbour say that actual retention is rare in the retro-uterine variety. This symptom is quite common in the ante-uterine form, and is probably due to mechanical causes, as the bladder is forced downward and backward, doubled upon itself. Vesical catarrh is frequently noted. Voisin has observed in a number of cases a dysentery occur at irregular intervals, and considers it of utility in favoring absorption. This description defines the acute form of pelvic hæmatocele. In its more chronic development the first feature to attract attention would be the attack of more or less severe pain, severe abdominal tenderness, not much if any distension, with possibly a normal temperature, and possibly difficult defecation and sense of fulness in the

pelvis, with the detection of a tumor in Douglas's sac if an examination is made.

The patient may be upon her feet before the expiration of a month, but at the next menstrual period the attack recurs, it may be with greater severity. If the pelvis is again examined, the retro-uterine tumor is again observed, increased in size over that first detected, and with more marked general disturbance. Thus, month after month there are repeated attacks until the patient is brought into an exceedingly dangerous condition. This train of periodic symptoms simply defines a repeated pelvic hemorrhage.

One of the most remarkable features of an attack of pelvic hæmatocele is the tumor itself. Speaking of this in its early development, McClintock says: "We may satisfy ourselves that it contains fluid, but whether this fluid be blood, serum, or pus cannot be determined by the most delicate sense of touch." The sudden filling up of the pelvis, the rapid distension of the abdomen, the vesical and rectal symptoms marking the great displacement of the pelvic viscera, are traits that in the acute hæmatocele define it from nearly every pelvic accident. Strange to say, however, even in this marked form the pelvic tumor may afford matter for serious doubt. Nearly every writer upon the subject agrees that the pelvic tumor can be felt from the earliest moment in the history of the case. Instances by Sireday, Aran, and Bernutz show that this may not be so, and McClintock first, and Tait later, have shown that it cannot be so. Blood when it is first effused does not coagulate, and without coagulation we cannot have an intrapelvic or abdominal mass. A fluid free in the abdominal cavity cannot give the defined limits of a tumor. A small collection would give doubtful evidences of fluctuation. There is, therefore, a pause in the stage of development when the attack is free from the local evidences of pelvic tumor. This embraces the period from the beginning of the attack until the coagulation of the effused blood. The rapid distension of the abdomen observed in some cases is probably due to meteorism, which has its origin in the profound nervous disturbance, as when the more acute symptoms subside on the second day this general abdominal distension is much less. We are to look independently of this for the tumor, which will be found occupying the Douglas space toward the end of the first day. This matter has now been so positively stated by the excellent authority of McClintock and Tait that this error should be eliminated from the textbooks.

A consideration of the tumor naturally brings us to a study of the subject of physical exploration, which, in view of the exhausted and threatening condition of the woman, has to be practised with peculiar care. When the retro-uterine mass is small, Tait's method of pelvic exploration is an excellent one, as the abdominal rectal or vaginal

double touch, which is especially painful, may be avoided. With the woman upon her left side the left index finger is introduced into the rectum, and the thumb of the same hand into the vagina, or with the woman upon her back the right index may be used for the rectal exploration and the right thumb for the vaginal. In this way the thickness and density of the tumor in the Douglas space may be clearly made out more readily than by any other method, as well as its non-connection with the uterine body and cervix. By the vaginal touch we show the marked forward displacement of the uterine body. In the instance of larger pelvic masses the abdomen is enlarged and rounded, and the tumor may be felt approaching the umbilicus and spreading toward the ilia. By vaginal exploration we discover a condition closely resembling a retroversion of the gravid uterus at three or four months (Barnes). The finger cannot enter the hollow of the sacrum, because it is occupied by the retro-uterine mass. The posterior vaginal wall is displaced forward and the direction of the canal altered; following the vagina, the finger passes forward and enters the anterior vaginal fornix, which is diminished to a narrow space behind and above the symphysis pubis, where we find the cervix uteri closely compressed against it, sometimes even flattened. With some care the finger can be passed in front of the cervix and somewhat laterally, in which movement of the finger the forward limits of the tumor are detected, blending with the cervical wall so closely that the margins of the latter are defined with difficulty. With the posterior margins of the cervix the tumor is blended in a peculiarly deceptive way, very much as the posterior cervical wall disappears in the uterine body in retroversion of the gravid uterus. At first the mass is soft, with a sense of elastic fluctuation. After two or three days it becomes firmer and more tense, or quite solid, caused by advancing coagulation and inflammation with plastic affusion, which more securely walls in the mass.

In these large effusions the uterus can be defined from the mass only by aid of the sound. It is needless to add to the cautious reader that this instrument must be used with the greatest gentleness and care. The way is first cleared by emptying the bladder with the catheter, and the sound guided by the fingers forced forward, and some considerable manipulation may be necessary. The curve enters forward and upward, and the point may be felt through the abdominal wall directly over the symphysis. By external manipulation the uterus may be felt upon the point of the sound, its lateral walls defined, and the tumor moved without imparting any motion to the uterus. This shows that the tumor is unconnected with the uterus. Leaving the sound in the uterine cavity, the finger may be introduced into the rectum, where it detects a rounded, more or less yielding tumor, to which no movement can be imparted by manipulating the sound within the uterus. An exam-

ination carried out in this way demonstrates that this quickly-developing tumor, attended with pain, shock, and anæmia, is not uterine or an ovarian tumor or a fibroid, as nothing will give this rational and physical symptom but a pelvic effusion of blood. At a very early period it may be impossible to make this careful local exploration, as the patient's condition will not permit the least excitement; and if this holds true, it is prudent to wait several days before undertaking it, as the physician will find enough to do without going into elaborate methods of examination.

The tumor is often felt through the vagina before it is above the brim of the pelvis. The extent of swelling in the vagina depends upon the depth of the Douglas space. Voisin states that early in the history of the effusion the tumor is slightly movable. This might hold true of very small effusions after firm coagulation and before it is enclosed by plastic effusion. It is a doubtful sign, and had better not be relied upon. The tumor often does not at once attain its maximum size, but advances, not continuously, but by a series of starts which correspond with the menstrual periods. In some cases a small tumor may be detected in front of the large tumor just above the pubes, which is the uterus, as may be proven by the employment of the sound. The hemorrhagic tumor varies in consistence at different parts, fluctuating in one region, elastic in another, or soft or resistant at another. At some points it gives the sensation of a solid tumor, but for the first week usually the tumor over its general surface gives the peculiar feel of a blood-clot (Poncet).

In Poncet's monograph Bouchacourt is stated to have observed bloody urine. In some cases the tumor has pressed upon the ureters, throwing the urine back upon the kidneys, causing uræmia, with fatal results. The pressure exerted by the mass upon the lumbar or sacral plexus of nerves causes severe neuralgia within the limits of these nervous areas. Under some circumstances the tumor compresses the large venous trunks and causes œdema of the lower extremities, being greater upon that side which corresponds to the greatest bulk of the mass. Cases of phlebitis of the side exposed to greatest pressure have been also noted, in some instances too early for the condition to be due to blood-poisoning; or possibly one ought to say, rather, that no evidence of blood-poisoning other than this had appeared. And in other instances traces of general infection developed long afterward. It is difficult to regard the phlebitis as due simply to pressure, unless, as we have noted above, it is the sudden development of the mass, which causes its presence to be so much more actively resented by the near parts than is usually the case in pelvic tumors of more gradual development. Extensive œdema of the vulva and vagina has been noted and explained as due to the pressure. In an instance of œdema of

the vagina the part formed a sort of cushion which projected forward between the labia. The latter is a common feature that attends large effusions, and is associated with œdema of the extremity; but the phlegmasia dolens is rare, but two cases observed by Madge and one by Bernutz having been noticed.

In the metrorrhagic hæmatocele a flow of blood is noticed externally from the vagina during the attack. The peritonitis is very slight as a rule, and a cachectic appearance rapidly develops. The periodic exacerbations so marked in the menstrual variety are absent. Another feature of this form is a frequently-recurring metrorrhagia a few hours or days after the attack, and continuing until absorption of the pelvic effusion. This variety is quite prone to be attended with nausea and vomiting. Snow Beck notes an instance of marked exception to the rule in which the pain ceased on the appearance of the tumor, or, as he ought to have said, when coagulation of the effused blood was complete.

In the cataclysmic cases of Barnes only that portion of the blood settling in the pelvic cavity coagulates, and that imperfectly. Peritonitis does not take place; the blood does not therefore become encysted, and thus no tumor forms. Collapse and death intervene too quickly for the usual train of symptoms to form. Notwithstanding the fact that the loss of blood is the cause of death—in fact, may be called the disease itself—yet the most active feature of the attack is the great preponderance of shock over anæmia.

The symptoms of pelvic hæmatocele due to cachexia are the more gradual advance of the hæmatic accumulation, the pain gradually gaining intensity, a lowering of the temperature partly due to blood-loss and in part to shock. A well-defined pelvic tumor is in some cases absent, especially in a lowered and vitiated state. A fatal ending is common. Pelvic hæmatocele attending typhoid fever is needless to refer to, as the accident is necessarily fatal.

The course and termination of a pelvic hæmatocele are very uncertain factors, in our estimation, of the disease. While it may be said that hæmatocele, except in most severe forms, always terminates without destroying life, yet it is very difficult to estimate to what extent the subject's future may be affected. As the local condition advances to a favorable termination, the tumor grows smaller and firmer. This is the first act in the absorptive process. In twenty-four cases observed by Carl Braun absorption was complete in from two to six months. In twenty-five cases noted by Voisin fifteen terminated in absorption. Bandl noted the following periods in which this termination was completed:

In 2 cases in 1½ months.
In 3 " " 4 "
In 1 case " 6 "
In 1 " " 8 "

In whatever way health is restored, the process is a slow one. The progress toward recovery is subject to so many interruptions, owing to the intimate relations of the tumor to the menstrual function, that the natural termination is indefinitely prolonged. In some instances no marked change occurs after several years, the tumor maintaining its same relative size and density. Delore has recorded a case that presented the same appearance for five years. Such a case is exceptional (Poncet). Dr. Barnes says that many cases supposed to terminate by absorption gradually diminish in size as their contents escape through a small opening, but so slowly as to elude notice. In the minor forms of hæmatocele, with a moderate effusion, in some cases so small as almost to escape notice, and with all the general symptoms moderate to a like extent, absorption is the rule, and in a few days, or at most a few weeks, the mass disappears as quietly as it came. Barnes asserts that these cases are very common; but if so, their true nature is not yet commonly understood by medical men. We may know when a hæmatic tumor of the pelvis is terminating by absorption, as the mass grows smaller and firmer to the touch. The latter sign is a point in spontaneous absorption, for if the tumor becomes soft and fluctuating it indicates that the contents are breaking down and it is seeking an external opening. The amount of extravasation, the age, and the general condition of the subject are the circumstances that modify the duration of the absorption process. Poncet states that when the mass has kindly relations with the menstrual function, resolution advances by successive amendments coincident with menstrual epochs, and consequently having a duration of several months. He is emphatic in the opinion that termination in health is the rule, especially when all surgical treatment is abstained from.

When the contents of the hæmatocele escape externally, the outlet is formed by ulceration of the cyst-wall outward, by the rectum, by the vagina, or through the encapsulating membrane into the abdominal cavity. Bandl states that the most frequent exit is into the rectum. In twenty-seven cases Voisin noticed escape into the rectum six times, and in a like number of cases it gained an outlet by the vagina in three. Escape into the peritoneal cavity is always a fatal channel of exit, and fortunately occurs but rarely. Escape by the rectum is liable to be attended with dangerous result. Fecal matter may find entrance into the sac of the hæmatocele, and gas from the rectum is quite sure to. The consequence is rapid changes in the contents of the cyst with quickly-developing evidences of blood-poisoning. The fetor generated in the cyst under these circumstances is *sui generis*. Septic intoxication is rare after opening by the vagina, but the vaginal walls offer greater resistance to the ulcerative process than those of the rectum. Sometimes a double perforation by rectum and vagina is met with, and rare

cases are on record in which triple openings occurred, by rectum, vagina, and abdominal wall. Instead of gaining exit quietly by the rectum, a sort of crisis is observed. The pain becomes severe, exasperated by pressure or movement, chills with marked high temperature, vomiting, skin dry, pulse small and frequent, with colic and tenesmus. After some days, and following an abundant diarrhœa, there is a general and sudden amendment, attended by escape of black and offensive discharge by the rectum. There is at once a rapid diminution in the size of the abdomen, but the tumor, instead of entirely disappearing, results in a small induration which persists indefinitely. A quantity of fluid as large as four quarts has been known to escape by the anus.

The degeneration of cyst contents into pus is an infrequent termination, and attended with alarming symptoms. Chills, fever, dry skin, rapid and shrinking pulse, severe pain in the loins extending to the legs, are the most marked evidences of this dangerous change. The symptoms resemble those of perforation of the cyst into the abdominal cavity, but are of longer duration. When the cyst contents find their way into the peritoneal cavity the termination is nearly certain death. When death results in the usual course of the disease, it is caused by wearing the patient out. Profound alterations of nutrition, prostrating high temperature, exhaustion, death, are the fatal chain of events.

Diagnosis.—The positive recognition of pelvic hæmatocele at its various stages offers one of the great problems of pelvic diagnosis. It is sometimes very easy and at others exceedingly difficult. The period at which the disease is brought under observation has much to do with its easy recognition. Dolbeau says that while pelvic hæmatocele is not the only pelvic disease that begins suddenly, fever, sudden and severe pain, and abdominal distension may occur in pelvic peritonitis and in intense ovarian congestion. Pelvic hæmatocele is never ushered in with fever, nor is ovarian congestion: to guard against error he trusts to one unfailing sign—namely, the direction in which the cervix is displaced forward behind the symphysis.

Intraperitoneal effusion makes its appearance without premonitory signs, and in general terms the symptoms are those which characterize hemorrhage. In the menstrual group there is defect in menstrual excretion which precedes the outbreak; and in the hemorrhagic group there is a profuse discharge of blood from the genitals before and during the act of intraperitoneal effusion. In the first there is severe peritonitis with less anæmia and prostration, and in the second less peritonitis with greater prostration and evidences of hemorrhage. The degree of collapse in hæmatocele is quite out of proportion to the amount of blood lost, as a rule. In the hæmatocele of menstrual retention there is what one may call the secondary shock, due to the quickly supervening peritonitis. In rupture of the ovary the effusion

is sudden and profuse; the rupture of ovarian varix is improbable when there are no signs of venous stasis in the lower extremities, and especially on the external genitals, either past or present.

In case of small ovarian tumors yet in the pelvis suddenly taking on inflammatory action, the pain is sudden and severe, the cyst not movable, with rectal or bladder symptoms. The diagnosis is made yet more difficult by pelvic effusion being sometimes one-sided and cyst-like, as in a specimen exhibited by Phillips at the London Obstetrical Society (1868). It is safe to say in ordinary cases that the ovarian cyst displaces the uterus to one side, while the hæmatocele forces the uterus forward without obliquity. Expectation would clear up the atmosphere of doubt that obscures this condition, or a careful aspiration would at once expose the character of the retro-uterine mass. In the case of small ovarian tumors becoming ruptured, Winckel makes the point that while the pain and collapse would resemble that of hæmatocele, the cyst contents would diffuse themselves and the tumor grow smaller and softer, notwithstanding the peritonitis, while the hæmatic tumor would grow larger and firmer. Ovarian tumors occupying Douglas's space present a history of considerable duration, have uniform density of surface, fluctuate on palpation, with no peritonitis or variation in volume as in hæmatocele. The symptoms of compression of rectum and bladder gradually intensify in the cyst, but in hæmatocele these symptoms present themselves early and gradually abate. Between an incarcerated, inflamed retro-uterine cyst and a hæmatocele with a like history and symptoms, the difficulties of differentiation are sometimes insuperable. Nothing but aspiration with a small needle can prove the difference. McCormick gives an instance in which even this failed.

A retroflexion of a gravid uterus at three months is very difficult to distinguish from a retro-uterine hæmatocele. A hæmatocele has, in fact, been so mistaken in several instances. In the gravid uterus there are softening of the neck, absence of menstruation, the characteristic discoloration of cervix and vagina, a smooth, uniform, and elastic tumor, giving consistency of surface at all points, with marked line of flexion between the cervix uteri and body. Pain in this condition is functional and due to disturbance of near parts. Contrast with this a tumor of uneven surface, with points of varying consistency, the peculiar displacement of the uterine cervix, and absence of the flexion line, while the pain of hæmatocele is persistent, with the tumor itself as a point of radiation. A very difficult problem to solve is presented in this case, and if an anæsthetic affords any advantage it ought to be employed. Expectancy furnishes a clue to the real nature of the pelvic disturbance. In hæmatocele the tumor shows a disposition to shrink and the pain to abate; in retroflexion of the gravid uterus the tumor grows firmer, larger, with an increase of functional disturbance of near parts.

Gallard says that we may search in vain for differential signs between extra-uterine pregnancy and hæmatocele. It is well to notice what few we have. The tumor of extra-uterine fœtation is rare in the retro-uterine space; hæmatocele is common. In the first the tumor is of slow growth, with the rational signs of pregnancy—fœtal movements, breast-changes, amenorrhœa, sometimes menorrhagia, but not metrorrhagia as in hæmatocele. If not called in until the rupture of the fœtal sac, it is doubtful if a differential diagnosis can be made. If one had a chance to deliberately study the case before the catastrophe of rupture, it is probable that a mistake would not be made.

In a paper on perimetritis by Dr. John Williams in the London Obstetrical Society, Dr. Graily Hewitt said that it and hæmatocele were very difficult to distinguish. At the outbreak of the attack the local conditions afford but little evidence of value. Both diseases are attended with rapid accumulations in the Douglas space—in the one with chill at the opening of the attack usually, inflammation always; and in hæmatocele we have shock. In pelvic peritonitis the chill is the beginning of a continued fever, while in hæmatocele it is frequently repeated. In the latter the pelvic mass antedates the chill, and in the former the chill precedes the pelvic tumor. In cellulitis the tumor presents itself slowly, and is not severe or sudden, and is usually situated to one side in the broad ligament, and the tumor is not so large as in hæmatocele; further, the board-like induration of cellulitis is not detected in the hæmatic tumor. If the attack follows labor or abortion, the evidence will favor pelvic peritonitis. If the symptoms begin during menstruation, and the discharge suddenly stops, and the cessation is coincident with pain, attended with chill, followed by fever, it is probably peritonitis. If menstruation were due, but did not appear, but sudden and severe pain came on with collapse, it is more likely to be hæmatocele. If the attack is not associated with delivery or abortion, the diagnosis inclines more to hæmatocele than to pelvic peritonitis or cellulitis. The mistake of confounding a periuterine phlegmon with hæmatocele might easily be made, but the remarks already made would apply.

Dr. Rasch states that there is low temperature for twenty-four hours after an attack of hæmatocele—96° to 97° F.—and the uterus is more movable than in cellulitis.

In cases of adeno-lymphangitis in the post-pubic region, mentioned by Guérin, the mass is well defined by the double touch, and is small and nodular. The small tumors attending this disease posterior to the cervix could hardly be mistaken for a hæmatocele.

Dr. Smyly has detected urobilin in the urine in cases of pelvic hæmatocele, and gives it diagnostic value. When the urine is alkaline, the

pigment has the usual color; and when acid, it is red. A drop of zinc chloride in an ammoniacal solution shows the characteristic green fluorescence. In the spectrum a band between the green and blue absorption-lines is observed to attend the presence of urobilin. Urine containing the pigment has a clear to a dull-brown color. Dr. Wiltshire has noticed that cases of hæmatocele were attended by a peculiar jaundice, which is symptomatic and due to the absorption of the biliary coloring matter of blood when the effusion is large.

Bernutz formulates the following as a guide to the diagnosis of ovarian hæmatocele: "There is absence of menstruation or of any bloody discharge from the vulva at the time the symptoms developed; the coexistence at the commencement of the attack of two distinct groups of symptoms—one referable to internal hemorrhage, the other to inflammation of the peritoneum; lastly, the absence of dysmenorrhœa at the time or at the preceding menstrual period. Such a concurrence of symptoms is strongly confirmatory of ovarian lesion." In explanation of the above it may be proper to say that the absence of dysmenorrhœa demonstrates that no retention existed, and the absence of blood-discharge from the vulva shows that menstruation was not present.

The diagnosis between menstrual retention and hæmatocele depends on the relation of menstrual pain to the tumor. The pain in metrorrhagia occurs considerably before or at the discharge, while the periodic pain in menstrual retention occurs in the absence of discharge, with coincident distension of the pelvic tumor—a condition never observed in the tumor of metrorrhagic hæmatocele. The periodic increase of size in the menstrual hæmatocele is always attended by discharge from the vulva. Equally so in hæmatoceles from menstrual defect the effusion is preceded by absence of menstruation.

The diagnosis between sources of hemorrhage has been regarded as impossible. In rupture of the tube from over-distension and hæmatocele from menstrual retention the following doubtful distinction may be made: distension of the tube is a gradual process, and one attended at no stage by pain, while dysmenorrhœa is a leading trait of menstrual retention, especially the month previous to attack (Bernutz).

In the matter of the minute distinctions enumerated in the most difficult field of diagnosis, the pelvis, but little has been said about the history afforded by the patient. This is indeed the medium through which all the objective and subjective symptoms have to be viewed. Without this element in the study of a case no local exploration can be relied upon to furnish differences broad enough to rest a positive opinion upon. This remark is made in this connection because it applies with peculiar force to the differentiation of menstrual and metrorrhagic hæmatoceles from the deposits of inflammatory origin peculiar to the female pelvis.

Bandl mentions the occurrence of lateral hæmatometra in duplicate uterus. The deep and lateral relations of the mass, the periodic pain, the monthly increase and supervening decrease in size, the absence of fever and peritoneal inflammatory symptoms, point to a difficulty other than hæmatocele. The early age, a period nearly exempt from hæmatocele, gives additional grounds for distinction.

It is hardly possible that a fibroid uterine tumor can be mistaken for hæmatocele, but Gusserow has given some traits of the latter in this relation that may be worth mentioning. In fibroma the tumor is limited on all sides, uniform density, its mobility more or less, but clearly related to the uterus, absence of peritoneal tenderness in isolated fibroma —none of which characteristics belong to hæmatocele, which shows a tendency to diffuse itself, to dissect, as it were, into the surrounding tissue, which is sometimes observed in a marked degree on the vaginal wall.

Hart and Barbour assume in their diagnosis that inflammatory adhesions occur previous to the effusion. They say: "It is often said that effused blood naturally gravitates into Douglas's space. It is not so. It is there because it is affused near it and causes Douglas's pouch to bulge only when it is affused below adhesions which prevent its spreading." When in any given case, as above, on vaginal examination a firm convex tumor is felt, and the cervix so closely pressed behind the symphysis as to be almost inaccessible, and by the bimanual examination the uterine fundus is distinctly felt just below the abdominal wall, and generally to one side, we have a condition of affairs that, in connection with its history, establishes the existence of a pelvic effusion. Meadows gives great importance to the vaginal tumor coincident with the attack, as no mass can be produced so rapidly with such symptoms from other causes. The idea that a pelvic blood-collection gives no evidence of tumor prior to coagulation must be admitted; but Hart and Barbour, in order to be consistent with their opinion, as mentioned above, of antecedent adhesions, assert that a hemorrhagic accumulation in the pelvis gives no physical signs more palpable than flatus or ascites unless enclosed, and these can be recognized only by puncture or aspiration.

It must be rare that a cancer of the pelvic organs would give occasion to a mistake in diagnosis; but Gallard gives one case in which hæmatocele was believed to exist, but which on post-mortem examination turned out to be a cancer hæmatodes of the ovary which occupied a position behind the uterus. Marrotte recorded a case in which an accumulation of feces gave cause to suspect a hæmatocele. A purgative cleared up the doubt.

The same difficulties that attend the diagnosis of hæmatocele follow us in an examination of hæmatoma. Hart and Barbour say that when

the effusion is in the broad ligament it is difficult to recognize, and is usually found on post-mortem examination. The physical signs in typical cases differ in essential points from those of hæmatocele. The tumor occurs suddenly, with absence of inflammation for a longer period than in the intraperitoneal effusion. The tumor is not in the pouch of Douglas, but bulges around the uterus. The hæmatoma is especially liable to be mistaken for a cellulitic deposit. The situation of the uterus in the two classes of effusions gives but little evidence. When the uterus is forced above the pubes it is probable that the blood is extraperitoneal, and is effused between the folds of the broad ligament, which usually displaces the organ in the direction named (Madge). Unilateral hæmatoma is more frequent upon the left side, and in such a case the uterus is displaced laterally and appears to rest upon the tumor, while in hæmatocele the mass displaces the uterus upward and forward in the retro-uterine and downward and backward in the anteuterine groups. The uterus is more mobile in hæmatoma, which is probably due to the fact that peritonitis is less quickly developed, and not so severe as in the intraperitoneal effusions. Tait says that if the febrile symptoms have set in and the clot broken down, the diagnosis is mere guesswork, and any operative interference hardly justifiable. The following manipulation is suggested by Frankenhäuser and followed by Bandl: Before the blood is encapsulated—and we ought also to say before it is coagulated—if the patient is placed in the knee-chest position the blood will flow out of the Douglas space, and return again to the pelvis when the patient assumes the dorsal posture. In hæmatoma the tumor must keep its situation and form, no matter what position the patient may be in. Early in the attack—and it must be practised early to be of any value—when the patient is suffering pain and collapse, it must be difficult to practise this manipulation. If Hart and Barbour's theory is correct also in regard to the antecedent adhesions in Douglas's space being the cause of the hæmatic tumor in this region, the posture test would prove useless. This remark is thrown in for the benefit of the younger readers, in order to show the difficulties in harmonizing the conflicting statements of authors.

The form of the tumor may be to a certain extent a diagnostic sign of hæmatoma. If a tumor lateral to the uterus is quickly developed and connected with the uterus by an isthmus, it is probably in the broad ligament and extraperitoneal. It may be that there are two tumors laterally situated on the same level and connected by an isthmus: this condition is characteristic of hæmatoma. The surface of the tumor also affords evidence. In hæmatoma it is uneven, knobbed, and rough, owing to the unequal cellular spaces filled with blood. This is especially true of the lower surface of the tumor situated deep in the vagina. In hæmatocele the lower (vaginal) surface of the tumor is

smooth. The abdominal surface of the hæmatoma is sharply defined; in hæmatocele it is diffused from welding together of surrounding parts. The fact just spoken of, the vaginal prolongation of the tumor, is very characteristic of hæmatoma. In hæmatocele the tumor cannot invade the vagina farther than the extent to which Douglas's pouch descends below the uterus. It is true that this varies greatly in individuals, but the bulging of the vaginal wall in hæmatoma is more usually found lateral or antero-lateral; and, further, in hæmatoma the vaginal tumor gives the peculiar feel of having dissected its way into the cellular spaces of the part.

The following table of differential diagnosis is condensed from Courty, and may prove of value to the reader:

Phlegmon of the Broad Ligament and Suppurative Peritonitis.	*Hæmatocele.*
Connected with delivery, abortion, or inflammation of pelvic organs.	Unconnected with any of these conditions, and manifested at other periods than those of delivery.
Phlegmon, a tumor of moderate size, not displacing cervix, often at the side, formed after the commencement of symptoms, hard at first and very sensitive, gradually softening and becoming fluctuating.	Large tumor pushing forward the cervix, behind which it is situated, formed at the commencement of the disease, soft at first, not sensitive, hardening with time, and losing the character of fluctuating, descending to the lowest portion of Douglas's space, and displacing the fixed uterus to a great extent.
Pelvic peritonitis rises above the brim, not displacing the fixed uterus to any great extent.	
General symptoms continuing till the pus gains an outlet.	General symptoms diminishing after a few days, long before the disappearance of the tumor.
Extra-uterine Pregnancy.	
Develops slowly.	Begins suddenly.
At first no functional disorder (?): afterward those of normal pregnancy.	General symptoms more or less serious from the beginning.
Fœtal sounds and movements.	Auscultation negative.
Sometimes amenorrhœa, at others regular menstruation, but no metrorrhagia.	Menstrual disorders coinciding with metrorrhagia.
Retroflexion and Retroversion.	
When non-gravid: slow development, no diminution in size.	Uterus and tumor distinct.
When gravid: symptoms of pregnancy.	
Fibroid Tumor.	
Development slow and continuous. Sometimes occur at menopause.	Development rapid, subsequent diminution, always in period of sexual activity.

Fibroid Tumor (*continued*).	*Hæmatocele* (*continued*).
Amenorrhœa, leucorrhœa, or metrorrhagia.	Menstruation and metrorrhagia.
Nodulations, density unequal.	Regularity of outline, equal density.
Softening rare.	Softening frequent.
Ovarian Cysts.	
Development slow, but unlimited.	Rapid development, followed by decrease.
No symptomatic disorders.	General symptoms more or less serious.
Tumor always (?) fluid and fluctuating.	Tumor at first fluctuating, and then hard.
Hæmatoma.	
Tumor descending into recto-vaginal septum.	Tumor higher up, projecting at the sides and behind uterus.
Uterus pushed upward and forward, more distinct from the abdominal tumor.	Uterus fixed in varying directions.
Violet color of vaginal cul-de-sac.	No discoloration; frequent paleness of mucous membranes.

In conclusion, we may quote from Hart and Barbour: "Hæmatocele and hæmatoma are symptoms, but the diagnoses of the conditions causing the hemorrhage, unless in cases of extra-uterine pregnancy, are beyond our clinical knowledge."

Pelvic Hæmatoma.

Wherever possible in our study of hæmatocele, we have thrown it into contrast in all its relations of cause, effect, and symptoms with hæmatoma. The field has thus been very much narrowed in all that relates to the unstudied part of hæmatoma. So important are the distinctions to be made between these different pelvic conditions, and so frequently are they confounded by authors and practitioners, that hæmatoma deserves a separate study.

Anatomy.—Blood effused within the pelvis, but external to the peritoneum, takes certain directions more or less definite. Tripier has made experiments to determine the resistance of the peritoneum. He first injected colored fluid into the broad ligament from the direction of the ovary. A pyramidal tumor was formed in the ligament as the first result. A larger quantity of fluid with greater force caused an extension of the fluid behind the rectum, forcing it forward. The fluid discolored the mucous membrane of the vagina. This discoloration of the peritoneum did not extend beyond the junction of the neck with the body of the uterus, and that organ was not discolored. When the canula was placed at the posterior border of the broad ligament, the

fluid filled, first, the vesico-uterine cul-de-sac, and secondly, the posterior cul-de-sac, both sides at once. He made the remarkable experiment of using a pressure syringe connected with a manometer, and measured the force necessary to rupture the broad ligament by distension. It equalled two atmospheres. Poncet explains this great strength by the character and distribution of the connective tissue of the ligament. These experiments, further than testing the resistance of the peritoneum and the channels of connection through the connective-tissue spaces when distended by fluid under pressure, prove nothing. The difference between the living and the dead subject is too great. We may also observe that the fluid in Tripier's experiments was distributed in a manner never recorded in pelvic hæmatoma. Beigel verified by post-mortem examination a large hæmatoma in the folds of that portion of the broad ligament known as the ala vespertilionis. The subject died from pneumonia, and the discovery of the hæmatoma was accidental. Nona says that the effused blood is generally covered by false membrane, but this is not so, and in the carefully-made dissections by Ball, so frequently referred to by Poncet, no covering of this character was observed.

As already referred to, there is great difference of opinion as to the frequency of hæmatoma. Bandl asserts that it is rarely met with outside of the puerperal condition. All those who follow Bernutz hold that hæmatocele is very frequent and hæmatoma very rare. Tait on his individual experience believes that hæmatoma is ten or twelve times more frequent than the intraperitoneal effusion.

Causes.—Olshausen relates a case of anteuterine hæmatoma following acute dysmenorrhœa. The anterior lip of the cervix was shortened, and the anterior vaginal vault driven backward by a tumor of half-soft consistency. Many cases of hæmatoma attend forced abortion at the early weeks and rough manipulation in gynecological operations. These cases are frequently mistaken for cellulitis. Careful attention to the order of morbid events will define it from the latter condition. In hæmatoma the local lesion precedes pain and fever. In inflammatory deposits fever and pain are preludes to the development of the pelvic mass. Further, the induration in cellulitis is detected in regions in which the minor forms of hæmatocele are rarely observed. We find the latter developing, as it were, in the vaginal wall, forming small, well-defined masses, usually posterior to the vaginal portion, rarely lateral, with a slight degree of uterine immobility, while cellulitis is diffused and generally lateral. The termination is the same in both cases, and unless the distinction is made early it may be difficult, if not impossible, to recognize the difference. It may be said that we have passed through the period of cellulitis in pelvic pathology, and other conditions will now come to the front that were formerly confounded with it.

Diagnosis.—It is important to make a clear diagnosis between hæmatocele and hæmatoma. Both are sudden in their development. If the patient is menstruating at the time, the probabilities favor the catamenial variety of hæmatoma. If the subject has not menstruated for eight or ten weeks, rupture of an extra-uterine fœtal sac must be considered. If menstruating at the time of attack, with arrest of the flow from exposure to cold or chill, it is probably hæmatoma. The symptoms are more intense in intraperitoneal than in extraperitoneal. Tait says that he never saw anything alarming in the first onset of the latter form. The limitations of the tumor to the Douglas space, not being felt above the brim, are characteristic of hæmatocele. When beyond the peritoneum the tumor is clearly distinct from the uterus, but closely connected with it, is felt above the pelvic brim, and is soft or indistinctly fluctuating. Examination by the rectum shows that the tumor disappears to the right or left of the passage, or, in other words, the tumor is sharply defined. Tait says that he has seen the extraperitoneal effusion (hæmatoma) contain pints of clots and reach not far short of the umbilicus. In doubtful cases if the aspirator is used and pus escapes, it is parametritis; and if blood-débris and pus, it is a suppurating hæmatoma. The diagnosis is very difficult when small blood-clots form within the folds of the broad ligaments.

Prognosis.—In the case of the small clots last noted above, the termination is, with scarcely an exception, favorable. In the more severe form serious differences of opinion exist. Poncet claims that hæmatoma is more grave than hæmatocele, as it is more liable to rupture the peritoneum, but so far as clinical records are known this opinion has no value. Kuhne believes the outcome is favorable. Bernutz views it in a very serious light. Courty states that the periuterine hæmatoma generally terminates in recovery by absorption, and qualifies his opinion by the statement that the outlook is not so favorable as in hæmatocele, as rupture of the peritoneal covering and escape of blood-clots into the abdominal cavity usually cause death. Tait, on the other hand, says that the hæmatoma is rarely fatal, while the intraperitoneal is generally fatal. When the effusion is into the cellular tissue, the natural tendency is toward spontaneous arrest; if into the peritoneum, the hemorrhage is excessive and irritation of the peritoneum very great. However, out of a large number of cases Tait never saw but one fatal. It is undoubtedly the fact that the more generally approved idea of the prognosis of hæmatoma is expressed by the latter author. Those cases of hæmatoma that occur in the latter part of pregnancy or in childbirth or the lying-in are much more serious than those that are noticed at other periods, and, as a rule, are the only cases concerning which any anxiety need be felt.

Symptoms.—The effusion is more gradual than in hæmatocele—less

pain and less shock. Kuhne says that the pain is due to the rending of the connective-tissue elements. The pain is intermittent, caused by the successive escapes of blood. We may note the absence of peritonitis, meteorism, and the clear definition of the line of dulness if the mass presents above the pelvic brim. In examination by the vagina the tumor is found just within the vulva, nearly always below the normal limits of Douglas's sac. Bernutz reports cases of lateral tumor at the junction of the middle and lower third, and existing in the recto-vaginal cells. The lateral situation is rare, but when found it is characteristic of a hæmatoma only. Poncet says that he has never seen hæmatoma develop in the vaginal wall anterior to the cervix; while Nona has rarely seen them in this situation. Prost assigns great importance to the fact that hæmatoma will displace the uterus upward, just as hæmatocele will displace the organ downward and forward, while the cervix is displaced sometimes to the right or left. The uterus does not lose its mobility as in hæmatocele. Kuhne calls attention to the bridge uniting two lateral tumors, which has been already described. Through the speculum the vagina presents a violet color in those portions contiguous to the tumor. Nona gives this appearance high diagnostic value, but according to Bernutz it is not always constant. The hæmatoma has a doughy consistency, a false fluctuation, and maintains its characteristics longer than hæmatocele, as its contents change less rapidly. Absorption is more prolonged in hæmatocele, while the latter is more disposed to rupture into the rectum or the vagina.

Treatment.—The primary indications are, first, to arrest hemorrhage and avert or mitigate the shock; secondly, to treat the inflammatory complications, and lastly, the blood-poisoning that may result from septic changes in the effused blood.

To arrest hemorrhage we may employ cold irrigation of the vagina or rectum—three to five minim doses of the liquor sesquichloride of iron, sulphuric acid, tannin, alum, or acetate of lead and opium, avoiding hot baths and hot applications, sitz-baths especially, as favoring hemorrhage. Shock closely follows the blood-loss. The head should be placed lower than the body by removing pillows and raising the foot of the bed. Vomiting should be checked by pounded ice, while pain may be subdued as well as the system stimulated by ether or Hoffmann's anodyne. Moderate use may be made of stimulants or cordials, if retained by the stomach, without fear of renewing the hemorrhage. Sinapisms to the arms or inside of the thighs may be employed, as the pain of the application retards shock.

The cataclysmic cases are treated on the same principle as rupture of the uterus or of the cyst of extra-uterine pregnancy, or other great pelvic lesion; when peritonitis is present, with opium and the horizontal position. Purgatives should be avoided, as breaking the law

of rest. The bowels will probably act, as in other cases of obstruction, under the use of opium.

In from twenty-four to thirty-six hours the evidences of peritonitis present themselves. The tonic treatment is to be kept up. While excessive tenderness exists, warm poultices or fomentations; after that stage has passed blisters may be applied to the abdomen, as the peritonitis has a tendency to assume a chronic form. Bernutz advises us at the approach of a menstrual period, provided the local tenderness has abated to a sufficient extent, to apply leeches through a speculum to the cervix uteri and to promote the flow by warm-water injections. This treatment applies to the menstrual variety of hæmatocele. McCormick suggests mercurial plaster to the abdomen or friction with mercurial ointment, with iodide of potash internally; tonics after the subsidence of fever.

Emmet's treatment is hot-water irrigation to control inflammation, careful nursing, rest in bed with light covering. As in all cases of pelvic or abdominal inflammation, one should abstain from repeated vaginal and pelvic examinations. Make one as complete and thorough as possible, if necessary under ether, for diagnostic purposes; then stop.

The surgical treatment of pelvic hæmatocele may now be regarded as placed upon a firm basis. Emmet expresses the voice of the period in the emphatic assertion that surgical interference is rarely required. Bandl has formulated two rules: First, if the hæmatocele is, after a week, undiminished in size, with no amendment of symptoms, evacuate its contents; second, if pus or sanies appears to have developed, as proved by aspiration, open the sac. The first rule does not conform to the practice of English or American surgeons, and cannot be approved. We may suspect the degeneration of the cyst contents into pus by the presence of hectic and chills; and, having proved its existence, the only treatment that can afford relief is to apply the second rule of Bandl. Barnes's rules have in a large measure settled the practice. When the tumor softens and moderately enlarges, with high pulse and temperature, septicæmia is present, and the proper time for operation has arrived. The cyst should be punctured in the bulging part, behind the cervix, in the vaginal roof, with a moderate-sized trocar or bistoury. The instrument should be inserted in the direction of the axis of the pelvic brim, parallel with the posterior uterine wall. A sound inserted into the uterine cavity will aid in defining the direction in which the trocar should be inserted. If directed too much backward, it is liable to wound the rectum or enter the sac too obliquely for free evacuation. The opening may be further enlarged by dilatation if necessary, so that clots may have free escape. The cavity should be washed out daily with carbolic-acid solution or solution of mercuric bichloride. Sir

J. Simpson insisted on a free opening in pelvic hæmatocele: "Incise with a tenotomy-knife and enlarge the opening with the finger, breaking down septa and blood-coagula." Meadows recommends the very doubtful practice of puncture through the rectum. It is only necessary to remark that evacuation of the sac through the rectum exposes the patient to the same danger that attends spontaneous evacuation through the same channel. In cases of old hæmatoceles that have suppurated and ruptured into the rectum, a further danger is that they will go on discharging pus for years, exhausting the patient. Such cases must be treated by a free counter-opening into the vagina, "which is a perfectly successful operation" (Tait). The last authority says that puncture through the vagina rarely gives relief. Opening by the abdomen is not justifiable, and the one rule to be observed is, that all cases of intraperitoneal hæmatocele ought to be left to Nature, unless it is exceptional. Cases are upon record (Aran) in which after opening rapid decomposition took place within the cyst, due to the entrance of air. In modern practice, with antiseptic precautions, this danger ought to be remote.

The treatment of hæmatoma is based upon the same general plan. Surgical interference is rarely required.

BIBLIOGRAPHICAL NOTE TO ARTICLE ON "MENSTRUATION, AND ITS DISORDERS."

As an explanation for the absence of any reference to several papers and discussions on Menstruation that have appeared in the journals in the past eighteen months, I will say that my article on Menstruation, and its Disorders, was written in the fall and winter of 1885, and was ready for the press Feb. 1, 1886. When the proof-sheets were returned to me, I found it impracticable to change it without rewriting most of it, and it was left in its original state. Selected parts were read before the meeting of the Alumni Association of the New York State Woman's Hospital, Jan., 1886, but, at the request of Dr. Mann, they were not published.

W. GILL WYLIE.

JUNE 17, 1887.

AUTHORS' INDEX.

[See also lists of *Literature* referred to on pp. 93. 278, 548, 568, 586, 593, 599. 618, 635.]

A.

Adelon, 445
Agnew, D. H., 28, 41, 725
Aikman, John, 252
Albucasis, 22
Andral, 695
Apostoli, 387, 399, 400, 403
Appleton, 22
Aran, 377, 568, 664, 677, 696, 707, 723, 727. 752, 769
Archigenes, 676
Aëtius, 20, 676
Atlee, J. L., 27
Atlee, W. L., 27, 28, 64
Atthill, 568, 580, 653, 664

B.

Baird, 60
Baker, W. H., 62, 261
Balfour, 86, 176
Ball, John, 41, 433, 765
Bandl, 163, 219, 707, 736, 739, 741, 745, 755, 756, 760, 761, 762, 765, 768
Barbour, 101
Barker, Fordyce, 38, 395, 484, 581
Barnes, Robert, 568, 581, 583, 722, 736, 738, 740, 742, 750, 755, 756, 768
Barstellberger, 263
Battey, Robert, 36, 38, 39, 49
Beard and Rockwell, 385
Beck, Jos. R., 43, 433, 765
Beck, Snow, 639, 646, 738, 745, 755
Becquerel, 727
Bedford, G. D., 30, 63, 738
Behier, 709
Beigel, 70, 167, 738, 765
Bell, 24
Bennet, 377, 568, 571, 573, 576, 581, 661. 738
Bernutz, 568, 677, 687, 688, 689, 691, 693, 694, 695, 696, 700, 704, 715, 717, 727, 735, 736, 737, 739, 740, 742, 752, 755, 760, 765, 766, 767, 768
Bigelow, Henry J., 52
Bigelow, H. R., 57
Billinger, J., 27
Billroth, 712
Bird, 547
Bischoff, 409
Bixby, G. H., 63, 725
Boehm, C., 93
Boerner, 600
Boisin and Dugès, 447
Boisin, Mad., 157
Bouchut, 698
Boynham, Wm., 28
Bozeman, Nathan, 34, 36, 445
Brandt, 616
Braun, C., 568, 738, 755
Breisky, 260
Brickell, 46, 49
Briddon, Charles K., 56
Broca, 100
Browne, B. Bernard, 57
Budin, P., 93, 119
Bumstead, 593
Burns, 640
Buttles, M. S., 39
Byford, W. H., 36, 45, 56, 63, 66, 542, 568, 581, 723, 725, 728, 733
Byrne, John, 38, 62, 64, 738

C.

Cadiat, 124
Campbell, H. F., 45
Carrard, 477
Carreau, J. D., 681
Carrington, 224, 225
Chadwick, J. R., 45, 46, 53, 198, 199, 480, 692
Championnière, 554, 679, 680
Channing, Walter, 30
Chapman, E. N., 63
Chauvau, 93
Chrobak, 135, 141
Chromel, 641, 661
Churchill, Fleetwood, 640, 676, 738
Clark, 29
Clark, Alonzo, 30
Clark, C. M., 531
Clark, Edward H., 45
Coe, H. C., 61, 336, 698, 699
Coen, 242
Coleman, J. D., 259
Cooper, Astley, 483
Cornil, 91, 519
Courty, A., 91, 93, 445, 554, 568, 581, 641, 664, 680, 681, 709, 715, 723, 740, 746, 763, 766
Crede, 738

Creighton, 178
Cruveilhier, 252
Cullerier, 593
Cullingworth, C. J., 691, 722

D.

Dalton, 178
Davies, Gomer, 258
Davis, E. Y., 515
Dawson, B. F., 63
Decès, 742
Delore, 756
Delrand, 515
Denouviliers, 737
Déralz, 740
Dewees, Wm. P., 63
Dohrn, R., 72, 93, 262
Dolbeau, 741, 757
Doran, 180
Douglass, 22
Doutrelepont, 519, 523
Drysdale, Thomas M., 43, 64
Duhring, 534
Duncan, Matthews, 252, 465, 519, 520, 527, 657, 677, 688, 694, 695, 705, 722, 723, 738
Dunglison, 588
Dunlap, A., 27
Duparque, 593, 641
Duverney, 746

E.

Edis, 542, 568, 637
Elischer, 175
Ellinger, 433
Ellis, 189, 198, 224, 231
Emmet, T. A., 34, 35, 36, 37, 41, 42, 43, 44, 50, 54, 55, 63, 65, 199, 234, 252, 337, 338, 530, 597, 667, 680, 699, 704, 707, 714, 718, 720, 721, 722, 729, 738, 742, 743, 750, 768
Engelmann, 50, 141, 331, 387, 400, 403, 409
Erich, 499
Eustache, 476

F.

Fallopio, Gabriele, 87
Farre, 169
Fayrer, 525
Fenger, Christian, 55
Fenwick, Bedford, 529
Finn, 646
Fischel, W., 93
Förster, 593
Fort, C. H., 263
Foster, Frank P., 102, 118, 228, 233, 234, 362, 554, 698
Foulis, 84, 93
Franck, 737
Frankenhäuser, 146, 762
Frarier, 709
Freund, 708
Frey, 121
Friedländer, 141
Fritsch, 154, 354, 561, 568, 688, 701, 707, 716, 727

G.

Galabin, 527, 653, 662
Gallard, 735, 736, 737, 759, 761
Gantillon, 377
Garrigues, 56, 140, 192, 210, 228, 706, 719
Gartner, Herman T., 70, 93
Geigel, R., 70, 93
Gendrin, 377
Gillette, 531
Gilmour, 38
Giraldéz, 75
Girault, 475
Goodell, Wm., 36, 40, 42, 50, 54, 58, 66, 359, 433, 517, 530, 568, 617
Goodman, 46
Goupil, 687
Graaf, Regnier de, 80
Grandin, Egbert H., 667
Green, T. Henry, 536, 679
Greenhalgh, 356
Grobe, 236
Gross, 26,431
Guérin, Alph., 217, 709, 715
Gussenbauer, 109
Gusserow, 155, 761
Gurlt, 537

H.

Hadra, B. E., 59
Hagemann, 93
Harrison, 738
Hart, D. Berry, 682, 686, 724
Hart and Barbour, 101, 106, 109, 112, 125, 131, 132, 154, 167, 168, 188, 212, 222, 227, 228, 229, 233, 568, 602, 638, 644, 688, 708, 751, 761, 762, 764
Heath, 224, 229
Heath, W. H., 483
Hedenius, P., 93
Hegar, 149, 578, 617
Helie, 135, 137
Henle, 121, 142, 172, 187, 188, 189, 230
Hening, 137, 163, 169
Hennig, 536, 568, 582
Heppner, 269
Hermann, 107
Herrick, O. E., 56
Herzfelder, 738
Heschl, 600, 645, 746
Hewitt, Graily, 622, 654, 663, 738, 759
Heyer, 738
Heywood, 478
Hicks, Braxton, 694
Hildebrandt, 498, 499, 515, 537, 539
His, W., 94
Hodge, H. L., 29, 63, 599
Hodgen, 487
Hoggan, 643
Holden, 187, 497
Holyoke, 22

Howard, Wm. T., 58
Huguier, 113, 511, 736, 737, 741
Hunter, 23
Hunter, J. B., 56
Hutchinson, 523, 527
Hyatt, H. O., 264
Hyrtl, 198, 266, 516

I.

Ill, J. E., 444.
Imbert, G., 94

J.

Jackson, A. Reeves, 39, 53, 536, 616
Jacobi, 643, 644, 646, 647, 652
Jacobi, Mary Putnam, 59, 410, 437, 602, 638, 641, 647, 662
Jacobson, L., 94
Jenks, Edward W., 52, 55, 513

K.

Kaltzenbach, 578
Kammerer, 377, 454, 462
Kaposi, 527
Kaschkaroff, 660
Kehrer, 421, 441, 462, 617
Kelly, H. A., 58
Kennedy, 536, 580
Kerkring, 239
Kidd, 580
Kimball, Gilman, 45, 61
King, John, 28
Kirmisson, 534
Kiwisch, 511, 542, 547, 599, 638
Klebs, 268, 271, 738
Klein, 121, 139, 142, 164, 172, 176, 190
Klemm, 582
Klob, 534, 539, 542, 546, 574, 599, 601, 608, 637, 645, 649, 650, 660
Kobelt, 104, 109, 112
Koch, 519, 523, 530
Kocks, J., 71, 94
Kölliker, A., 69, 73, 79, 83, 84, 85, 91, 94, 237
König, 219, 723
Krause, 104
Kreiger, 738
Kuhne, 766, 767
Kundrat, 409
Kussmaul, 247
Kustner, 539

L.

Lallemand, 581
Lamballe, J. de, 377
Langenbeck, 242
Langier, 737
Langlade and Cummen, 239
Lazarewitch, 655
Le Bec, 123, 131, 146, 687
Lebedeff, 261
Lee, C. C., 55, 738, 740
Lefort, 243
Lenoir, 737
Lente, F. D., 39, 578, 581.
Leopold, 129, 140, 141, 172, 409, 554, 643, 644, 679, 680, 687
Lever, 640
Levy, 454
Lewis, W., 63
Lindgren, 142
Listrane, 589, 638
Lister, 165, 339
Litzman, 443
Lott, 141
Louis, 261
Lowenthal, 309
Luschka, 102, 121, 132, 169, 186, 188, 193, 221
Lusk, 101, 107, 142, 492, 536, 651, 711, 713
Lyman, Geo. H., 28, 48, 731

M.

McCarthy, Justin, 705
McClintock, A., 532, 677, 707, 711, 728, 735, 736, 738, 750, 752
McCormick, 758, 768
McDowell, 23, 29, 30
Madge, 738, 740, 755, 762
Mann, Matthew D., 56, 127, 131, 334, 339
Mapother, 447
Marchal, 676, 677
Marrotte, 761
Marsh, Howard, 727
Martin, 648
Martin, Franklin H., 365, 617, 666
Mason, 477
Massot, 532
Mayer, 243, 527, 538
Meadows, 736, 738, 739, 742, 761, 769
Meigs, C. D., 29, 63, 502, 654
Menière, 405
Meyer, H., 77, 94, 271
Meyer, Leopold, 236
Miller, Henry, 377, 581
Milne, Edwards H., 70, 94
Minor, Julius F., 38
Mitchell, Weir, 610, 633
Monod, 737
Morel, 237
Morris, 722
Mueller, J., 85
Mundé, 50, 53, 66, 250, 327, 398, 405, 443, 444, 480, 528, 554, 561, 578, 666, 679, 681

N.

Nandier, 710, 715
Nega, 242
Nélaton, 735, 736, 737, 745, 747
Newman, Robert, 61
Nickles, 663
Noeggerath, E., 37, 38, 45, 48, 431, 459, 460, 571, 599, 608, 617, 638, 660, 694
Nona, 767
Nonat, 627, 677

Nott, J. C., 30, 377, 516, 518
Nylander, 141

O.

Olshausen, 209, 236, 617, 652, 713, 738, 765
Oribasius, 676
Orne, 22
Osgood, 22
Ott, 737

P.

Paget, 527, 552, 731
Palfyn, 261
Pallen, Montrose A., 45, 443
Palmer, C. D., 35, 57
Paré, Ambroise, 22
Parry, John S., 39
Parvin, Theophilus, 38
Pattee, A. F., 62
Paulus Ægineta, 21
Pauly, 742
Peaslee, 36, 37, 64, 243, 245, 377
Peuch, 737
Peuch, A., 94, 236, 237, 255, 743
Pflüger, 176, 409
Phillips, 758
Physick, 26
Pick, 524
Pirogoff, 212, 488, 683
Playfair, 568, 580, 633
Polk, Wm. M., 56, 60, 192, 193, 210, 212, 215, 682, 688, 698, 699, 717
Pooley, J. H., 261
Post, Alfred C., 58
Post, Sarah E., 60
Poncet, 737, 740, 749, 751, 754, 756, 765, 766
Priestley, 542
Prochownick, 239
Prost, 737
Puzos, 676

Q.

Quain, 94, 105, 107, 112, 136, 224

R.

Raciborski, 740
Rainey, 159
Ranney, 101, 102, 105, 108, 113, 131, 141, 218, 228, 233
Rasch, 759
Récamier, 22, 30, 581
Reinmann, 547
Reyer, 525
Richard, 476
Richardson, W. L., 719
Richet, 740
Ricard, 593
Rieder, Carl, 72, 94
Rindfleisch, 748
Ringer, Sidney, 365, 562
Robert, 737
Robin, C. H., 124, 707
Rogers, D. L., 27
Rokitansky, 248, 546, 743
Rose, Cooper, 245
Rosenmüller, 75
Rouget, 139
Routh, 477, 568
Ruge and Veit, 143, 587
Ruysch, 737

S.

Sanderson, 678
Sanger, 536
Savage, 98, 99, 108, 109, 121, 135, 140, 157, 183, 186, 188, 189, 210, 226, 229, 684, 701, 723, 724
Scanzoni, 377, 516, 541, 547, 568, 599, 637, 641, 652, 661, 664, 722, 738, 740, 745
Schäfer, 216
Schroeder, 118, 354, 477, 480, 528, 542, 568, 617, 644, 646, 654, 705, 722, 738, 746
Schüller, 180
Schultz, 654
Schultze, 718
Schuppert, M., 38
Schuregius, 515
Schwimmer, 524
Scott, John, 59
Scultetus, 22
Sedgwick, 86
Serdukopf, Ar., 655
Shatz, F., 94
Silvestre, 749
Simon, 29, 187, 617, 709, 710, 715
Simpson, A. R., 653, 724
Simpson, Jas., 377, 511, 516, 536, 568, 637, 638, 640, 641, 644, 646, 661, 664, 727, 732, 738, 769
Sims, J. Marion, 30, 34, 36, 37, 39, 45, 60, 63, 475, 514
Sinclair, 600
Sinéty, L. de, 91, 94, 116, 117, 124, 125, 140, 143, 167, 475, 587, 644, 647, 652
Sireday, 752
Skene, Alex., 46, 48, 65, 71, 94, 185, 188
Smellie, 23
Smith, A. G., 27
Smith, N., 27
Smith, Tyler, 568, 739
Smyly, 759
Spiegelberg, 607, 686, 688
Stearns, 26
Steurer, 706
Storer, H. R., 36, 38, 63, 450
Stricker, 140
Stroinsky, O., 55
Surgus, Damien, 496
Sussdorff, 322

T.

Tait, Lawson, 169, 172, 180, 267, 409, 503, 505, 509, 519, 688, 691, 695, 701, 704, 705, 722, 724, 729, 730, 738, 742, 752, 766, 769
Taliaferro, V. A., 38
Tardieu, 262, 741
Taylor, I. E., 28, 57, 241, 259, 519, 567
Thin, 520, 527,

Thomas, T. G., 28, 36, 38, 49, 51, 54, 59, 63, 118, 355, 486, 510, 518, 542, 567, 568, 580, 599, 617, 638, 643, 660, 661, 664, 677, 705, 710, 727, 732, 738
Tilt, 738, 739
Tripier, 396, 764, 765
Trousseau, 562, 710, 742, 743
Turner, 141
Turnipseed, E. B., 263

U.

Ulrich, 738

V.

Van Buren, Wm. H., 678
Van de Warker, E., 51, 53, 132
Veit, 723
Velpeau, 677
Vidal, 527, 582
Vigués, 737
Virchow, 237, 520, 527, 547, 675, 678, 701, 705, 738, 741
Voisin, 737, 738, 739, 743, 748, 751, 755
Von Haselberg, 583
Von Preuschin, 124
Von Recklinghausen, 706

W.

Waldeyer, W., 68, 84, 86, 94, 172, 237, 270, 678
Walker, H. F., 252
Warren, J. C., 27, 54
Wassilieff, M., 72, 94
Watts, R., 72
Webster, E. H., 340
Wells, Spencer, 168, 480, 742
Wernick, 443
West, 568, 677, 716
White, J. C., 523
White, J. P., 36, 37
Whittaker, J. T., 242
Williams, 141, 144, 155, 409, 759
Wilson, Ellwood, 667, 672
Wiltshire, 760
Winckel, T., 94, 186, 236, 445, 461, 488, 491, 497, 530, 537, 678, 723, 740
Wolff, Casper Friedrich, 68
Wunderlich, 694, 702
Wylie, G., 135

Z.

Zweifel, 515, 536, 538

INDEX TO VOLUME I.

A.

Abdomen, examination of, 306
  inspection of, 306
  mensuration of, 307
  palpation of, 307
Abdominal section in pelvic peritonitis, indications for, 704
Abdomino-rectal examination, 301
Abortion, treatment of hemorrhage after, 419
Abscess, chronic pelvic, 56, 60
  pelvic, 721
    aspirating sac, 731
    diagnosis of, 726
    opening sac, 728
    pathological anatomy, 722
    sinuses, 732
    treatment of, 727
Acute eczema of vulva, 503
  metritis, 546
Adenitis, periuterine, 680, 759
Adeno-lymphangitis, 680, 759
Adhesions, pelvic, treatment of, 51–54
Air, fresh, importance of, 622
Alcoholics, use of, 624
Alexander's operation, 160
Alopecia of vulva, 500, 501
Amenorrhœa, 411
  electricity in, 391
  treatment of, 364, 413
Amputation of cervix, high, 150
  in metritis, 617
Anæsthesia in operations, 338
Angeioleucitis, 680
Angioma of vulva, 536
Antellexion, cause of dysmenorrhœa, 423
  of uterus, 256
Antisepsis, agents for, 329
  in gynecological operations, 328
Antiseptic injections in childbed, 662
Antiseptics in lupus, 523
Anus, fissure of, causing dyspareunia, 453
Apoplexy of ovary, 745
Appendages, uterine, 161
    disease of, complicating dysmenorrhœa, 420
Applications, intra-uterine, agents, 381
    by applicator syringe, 578
    by ingestion, 577
Applications, intra-uterine method, 380
  topical, in endometritis, 559
Applicator, cotton-wrapped, 577
  hard rubber, 564
  Sims's, 580
Applicator syringe, 578, 581
Arbor vitæ uterina, 134, 137
Arsenic, use of, in metritis, 612
  value of, 372
Arteries of ovaries, 179
  uterus, 143
Artificial impregnation, 475
Aspermatism, 453
Aspiration for diagnosis, 326
Aspirators, 326
Assistants in operations, 340
Astringents in congestion, 563
Atresia ani vaginalis, 261
  of hymen, 262
  of uterus, 253
  of vagina, 257, 458
  of vulva, 267
    treatment of, 478
Atrophy of uterus, 599
    treatment of, 618
Auscultation and percussion of abdomen, 306

B.

Bacillus tuberculosis in lupus, 519
Bartholin, glands of, 113. (See *Vulvo-vaginal Gland.*
Bathing in uterine disease, 621
Baths, hip, in subinvolution, 663
  sun, 621
Battey's operation, 39–49
Battey on removal of ovaries, 39, 49
Belladonna, action of, 370, 373
Bimanual examination, method, 298
Bladder, anatomy of, gross, 188
    minute, 190
  diseases of, works on, 65
  ligaments of, 207
  relations and attachments, 191
  sphincter of, 189
  supports of, 225
  symptoms, importance of, 291
Bleeding, local, in chronic metritis, 613
Boils on vulva, 494
Bowels, attention to functions of, 570, 626

Broad ligaments, 207
contents of, 209
in pregnancy, 208
Bromides, value of, 365, 374
Bulb of ovary, 180
Bulbs of vagina, 112
of vestibule, 112
Bursting cysts of abdomen, 54
Buttle's spear, 613
Buttonhole incision of urethra, 54

C.

Cancer as a cause of metrorrhagia, 417
of cervix, excision for, 62
of vulva, 537
pelvic, diagnosis from hæmatocele, 761
Carbolic acid in dysmenorrhœa, 428
Carcinoma of vulva, 539
Caruncles of urethra causing dyspareunia, 451
electricity in, 404
Carunculæ myrtiformes, 118
Cases, rational history of, 284
Catgut for sutures, 339
Catheter, passing the, 115, 197
Cedron as tonic, 369
Cellulitis, pelvic, 705
diagnosis, 714
from fibroids, 718
from hæmatocele, 717
electricity in, 404
etiology, 706
exudation, seat of, 715
pathology, 708
prognosis, 718
pus in, 710
symptoms, 710
non-puerperal, 713
puerperal, 711
treatment of, 60
curative, 719
prophylactic, 718
remarks on treatment of, 220
Centennial year, 46, 49
Cervical protector, Wylie's, 428
Cervix, amputation of, in metritis, 617
anatomy of, 587
appearances of, in Sims's speculum, 314
congestion of, glycerin and boro-glycerides in, 562
cystic degeneration of, 591
false ulceration of, 587
forcible dilatation of, 41. (See also *Dilatation.*)
granular degeneration of, 589
high amputation of, 150
in laceration, 149
in old age, 149
lacerations of, causing subinvolution, 651
operation for lacerated, 58
history of, 37
pathological anatomy of, 588
pelvic peritonitis following operations upon, 698
shape and size of, 133
Cervix, stenosis, dangers of incision for, 151
syphilitic ulceration of, 593
true ulceration of, 593
Chadwick's table, 295
Change of life, 436. (See *Menopause.*)
Chloral, use of, 374
Chromic acid as application, 566, 580
Chronic eczema of vulva, 514
metritis, 602
hot douche in, 613
quinine in, 630
sponge tents in, 616
pelvic abscess, 56, 60
peritonitis, 696
Clinic, first gynecological, 30
Clitoris, anatomy of, 106
attention to, necessary, 621
hypertrophy of, 447
treatment, 477
malformations of, 266
Cocaine, use of, 381
Coccyodynia, 516
causing dyspareunia, 452
Nott on, 30
Coccyx, neuralgia of, 516
removal of, 518
Coffee, use of, 624
Coitus during menstruation, effects of, 743
excessive, as cause of subinvolution, 652
hindrances to, from malformations, 446
impossible, causes of, 446
painful, 448
spasm in, from vaginismus, 515
Colica scortorum, 701
Columbia Hospital, report of, 41
Condyloma, examination, 298
syphilitic, of vulva, 531, 534
venereal, of vulva, 537
Congestion, use of astringents in, 563
Conjoined examination, 298
Connective tissue, pelvic, 215, 684
continuity of, 219
practical deductions on anatomy of, 219
Constipation, treatment of, 390, 627
Constitutional treatment of chronic uterine disease, 363, 619
Constriction at os internum, 152, 421
Contraction of os, 561
Corpus luteum, hemorrhage from, 745
Counter-indications of hot douche, 559
Course of chronic metritis, 601
of subinvolution of uterus, 659
Cowper's glands, analogues of, 113
Cumulus ovigerus, 83
Cupping the uterus, 614
Curette, in endometritis, 596
forceps, of Emmet, 597
Récamier's, 596
sharp, use of, 567
Simon's spoon, 361, 597
Sims's, latest form of, 418
Thomas's, 360, 596
used for diagnosis, 324
varieties of, 324

Curetting, method of, 598
the cervical canal, 567
Current, electrical, strength, 387
Cyst of parovarium, 75
of round ligament, case of, 488, 535
Cystic degeneration of cervix, 591
Cystocele, definition of, 487
Cystotomy, 126
Cysts, bursting, of abdomen, 54
of Gärtner's canal, 72, 535
of round ligament, 488
case of, 535
of vulva, 534
of vulvo-vaginal gland, 534
sebaceous, of vulva, 535

D.

Dagget's examining-table, 296
Decidua, uterine, 140
Defecation, importance of, as a symptom, 292
Denudation in plastic operations, 346
Depletion, local, 562
in chronic metritis, 613
uterine, value of, 379
Depressor, Sims's, 311
Diagnosis, artificial prolapse of uterus in, 325
gynecological, 283
of chronic metritis, 606
of early pregnancy, 149, 151
of endometritis, chronic cervical, 554
corporeal, 574
of masturbation, 478
of pelvic cellulitis, 705
hæmatocele, 757
differential, 763
from cellulitis, 717
from hæmatoma, 761
hæmatoma, 766
peritonitis, 697
from hæmatocele, 759
of periuterine inflammation, 658
of phlegmon of broad ligament from pelvic hæmatocele, 763
of retroflexion of gravid uterus, 758
of sterility, 464
of subinvolution of uterus, 655, 659
of tumors from subinvolution, 658
position of uterus in, 300
use of microscope in, 327
Diaphragm, pelvic, 223
Diet, importance of, in disease, 622
Dietetics, directions for, 368
Digestion, attention to, 625
Digital examination in left lateral position, 310, 315
method, 298
Dilatation of cervix, advantages of different methods, 357
by sounds, 359
dangers of, 359
for diagnosis, 319
for surgical purposes, 354
forcible, 41, 153
Dilatation of cervix, in dysmenorrhœa, 427, 433
Dilators, uterine, Emmet's, 321
Fritsch's, 358
Goodell's, 319
Hanks's, 320
Molesworth's, 320, 322
Nott's, 358
Palmer's, 320, 560
Peaslee's, 559
Schultze's, 358
Sims's, 427
Dimensions of uterus, 132, 152
Diphtheritic vulvitis, 492
Discharge, vaginal, as a symptom, 292
Discus proligerus, 83
Disorders of menstruation, electricity in, 388
Displacements cause subinvolution, 653
genu-pectoral position in, 46, 129
uterine, electricity in, 390
Divulsion in dysmenorrhœa, 429
Dorsal position in examination, 297
Double uterus, pregnancy in, 252
relation to superfœtation, 253
vagina, 259
Douche, hot-water, 379, 414
counter-indications, 559
in cervical endometritis, 556
in chronic metritis, 613
in endometritis, 545
in pelvic peritonitis, 754
indications, 558
mode of use, 557
Douglas, folds of, 210
Douglas's pouch, anatomy of, 211
boundaries of, 683
dangers of wounding, 127
depth of, 214
intestines in, 147, 212, 488
Drainage in ovariotomy, 45
Drainage-tubes, Wylie's intra-uterine, 429
Dress, importance of attention to, 621
rules for, 670
Ducts, Gärtner's, 70
Müllerian, 85
Skene's, 71
Wolffian, 68
Duverney, glands of, 113. See *Vulvo-vaginal*.
Dysmenorrhœa, 419
caused by retroflexion, 423
causes of, 421
classes most liable to, 424
complications of, 420
divulsion in, 429
electricity in, 390
forcible dilatation in, 433
glycerin and boro-glycerides in, 426
membranous, 434
pessaries in, 434
treatment of, 425
by dilatation, 427
by divulsion, 429
by sounds, 433
by sponge tents, 433

Dyspareunia, causes of, 448–452
caused by lacerations of cervix, 458

E.

Eczema of vulva, 503
chronic, 514
Electrical current, dangers from, in extra-uterine pregnancy, 406
strength of, 387
in extra-uterine pregnancy, 406
in uterine fibroids, 402
Electricity, in amenorrhœa, 391, 414
in chronic pelvic inflammation, 404
in diseases of menstruation, 388
in dysmenorrhœa, 390
in extra-uterine pregnancy, 405, 406
in fibroid tumors, 399
in hyperplasia uteri, 404
in menorrhagia, 391
in ovarian tumors, 398
in ovaritis and ovarian neuralgia, 393
in periuterine hæmatocele, 397
in subinvolution of uterus, 393
in subinvolution of vagina, 672
in superinvolution of uterus, 395
in uterine displacements, 396
in uterine stenosis, 405
note on use of, 632
use of, in gynecology, 373, 383
Electrization, localized, method of, 385
Electrodes, covering of, 387
size of, 388
Electrolysis in fibroids, 399
electrodes in, 404
in ovarian cysts, 50
pain in, 401
results in, 403
strength of current in, 402
Elephantiasis Arabum, 524
distinguished from fibroma diffusum, 527
Emmenagogues, 366, 414
Emmet's needle-holder, 348
operation, invention of, 37
Enchondroma of vulva, 536
Endocervicitis, silver nitrate in, 564
use of zinc in, 565
Endometritis, acute, 541
as a cause of subinvolution, 652
caused by gonorrhœa, 542
chronic, 548
cervical, 549
cause, 551
complications, 554
diagnosis, 554
frequency, 549
hot douche in, 556
pathology, 550
physical signs, 553
prognosis, 555
symptoms, 552
treatment, 555, 560
corporeal, 568
cause, 570
diagnosis, 574
frequency, 568
Endometritis, chronic corporeal, pathology, 569
prognosis, 575
symptoms, 572
treatment, 575
ingestion, 577
local method, 577
general, 568
fungoid, 574
curette in, 596
hot douche in, 545, 556
septic, 545
silver nitrate in, 581
Enucleation of fibroids, 44, 45
of pedicle, 38
Epispadias, 265
treatment of, 477
Epithelioma of vulva, 537
Erectile organs of female, 108
Ergot, action of, on sexual organs, 371
discovery of, 26
in uterine fibroids, 45
Erysipelas of vulva, 504
Erythema of vulva, 503
Esthiomène, 518
Etiology of chronic metritis, 602
of dysmenorrhœa, 421
of dyspareunia, 448.
of pelvic cellulitis, 706
hæmatocele, 738
hæmatoma, 765
peritonitis, 690
of periuterine inflammation, 677
of sterility, 467
of subinvolution of uterus, 649
of vagina, 669
Examination, bimanual, 298
digital in dorsal position, 298
in erect position, 316
in genu-pectoral position, 316
in left lateral position, 310, 315
in Sims's position, 310
dorsal position in, 297
in diagnosis, 296
in sterility, 466
of abdomen, 306
of rectum, 318
rectal, 301
recto-abdominal, 301
specular, 304, 313
vaginal, method of, 298
vesico-rectal, 302
Examining-tables, 294,
Excision of cervix for cancer, 62
Exercise, importance of, 620
Exploration, rectal, 29
External genitals, anatomy of, 96
os, 133
Extra-uterine pregnancy, cause of hæmatocele, 746
dangers from electrical current in, 406
distinguished from hæmatocele, 759, 763
electricity in, 405, 406
operations for, 28
Exudation in pelvic cellulitis, 715

F.

Fallopian tubes, anatomy of, 161
catarrh of, 163
development of, 87
hemorrhage from, 642, 746
malformations of, 237
mucous membrane of, 164
permeability by fluids, 582
by probe, 152
Faradization, general, 384
Fecundation, conditions of, 441
Fibroid tumors cause hemorrhage, 416
of uterus, electricity in, 399
uterine, removed through anterior vaginal wall, 56
Fibroids diagnosed from cellulitis, 718
from hæmatocele, 761, 763
electricity in, 60
of uterus, enucleation of, 44
removed by laparotomy, 57
Fibroma and fibro-myoma of vulva, 529
diffusum of vulva, 526
Fibrous tumors of uterus, Atlee on, 28
Fissure of vulva, 494
of anus, causing dyspareunia, 453
Fistula, artificial vesico-vaginal, history of, 31
in ano, operation for, 55
urethro-vaginal, Parvin's operation for, 38
vesico-vaginal, history of, 30
operation for, 30, 50
Floor, pelvic, anatomy of, 222
Follicular vulvitis, 492
Food, care in diet, 622
value of, in pelvic disease, 369
Forceps, tissue, 345
twisting, for wire, 352
vulsellum, 342, 349
Forcible dilatation in dysmenorrhœa, 433
Formulæ for constipation, 629
for pruritus vulvæ, 508
for tonics, 626, 631
Fourchette, anatomy of, 102, 105
Fungoid degeneration of endometrium, 594
Fungosities, uterine, 594
Furunculosis vulvæ, 494

G.

Galvanometer, necessity for, 387
Gangrene of vulva, 496
Gärtner's ducts, 70, 181
Gaseous tumor of vulva, 536
Genu-pectoral position for displacements, 46, 129
Geodes, 139
Gestation, incapacity for, 461
treatment, 472
Giraldez's body, 75
Gland, Skene's, of urethra, 71, 180, 185, 796
of Bartholin. (See *Vulvo-vaginal Gland.*)
vulvo-vaginal, catarrh of, 499
Glands, utricular, 140
Glycerin and boro-glycerides in dysmenorrhœa, 426
to vagina, 414
as a depleting agent, 389
in chronic metritis, 615
in congestion of cervix, 562
Gold, chloride of, action of, 372
Gonorrhœa, cause of endometritis, 542
pelvic inflammation, 691
warts of vulva, 536
latent, 48, 691
cause of sterility, 460
Gonorrhœal vulvitis, 492
Graafian follicles, anatomy of, 176
development of, 82
Gravid uterus, injuries of, 55
Granular degeneration, like cancer, 590
Greek gynecology, review of, 18
Gutheris's muscle, 186
Gymnastic exercises, value of, 376
Gynecological diagnosis, 283
examining-table, 294
Society, American, 46, 64
Gynecology, chairs of, 66
first American article on, 22
history of, 17
works on, 63, 65, 66

H.

Hæmatocele and hæmatoma, 736
caused by extra-uterine pregnancy, 746
distinguished from extra-uterine pregnancy, 759
first essays on, 38
pelvic, 735
bloody urine in, 754
boundaries of sac, 748
causes, 738
contents of sac, 749
contrast with hæmatoma, 748
diagnosis, 757
from cellulitis, 717
from hæmatoma, 761
of source of blood, 760
differential diagnosis, table, 763
history, 737
mobility of uterus in, 759
pathology, 743
symptoms, 750
temperature in, 750
termination of, 755
tumor in, 754
ulceration of cyst-wall, 756
peritonitis following, 747
periuterine, electricity in, 397
Hæmatoma of ovary, case of, 749
of vulva, 497
pelvic, 764
anatomy, 764
causes, 765
diagnosis, 766
prognosis, 766
symptoms, 766
treatment, 767
Hæmostatics, 118

Hair, inversion of, on labia, 502
Headache, treatment of, 631
Hemorrhage after abortion, treatment of, 419
from corpus luteum, 745
from Fallopian tubes, 642, 746
from vulva, 115
Heredity, importance of, 286
Hermaphrodism, 267
case of Carl Hohmann, 273
spurious, 277
Hernia, inguinal, 482
labial, anterior, 482
perineal, 487
pudendal, 486
uterine, 257
vaginal, 483
ventral, 60
Herpes of vulva, 502
History of gynecology, 17
rational, of cases, 284
Hohmann, C., the hermaphrodite, 273
Hook, counter-pressure, 349
Hot-water douche. (See *Douche.*)
Hot water, history of use of, 61
Hottentot apron, 267
Houston, valve of, 267
Hydatids of Morgagni, 238
Hydrocele, 488
case of forming large cyst, 535
Hymen, anatomy of, 117
atresia of, 262
development of, 92
examination of, 125
forms of, 118
malformations of, 262
medico-legal importance of, 118
of negro race, 263
resisting, 447
Hyoscine, hydrobromate of, 373
Hyperæmia, uterine, 599
Hyperæsthesia of vulva, cause of dyspareunia, 450
Hyperplasia, areolar, of uterus, 599
electricity in, 404
Hypertrophy, uterine, 599
of clitoris, 447
treatment, 477
Hypospadias, 265
treatment of, 477
Hysterectomy, vaginal, position for, 128
Hystero-neurosis, 50

I.

Ice, use of, after operations, 333
Impregnation, artificial, 475
Incontinence of urine after dilatation of urethra, 196
Induration, pelvic treatment of, 51
Inflammation of vulvo-vaginal gland, 500
Inflammatory exudations, cause of dyspareunia, 451
Inguinal hernia, 482
Injections, intra-uterine, 582
of hot water. (See *Douche.*)
Injections, parenchymatous, 616
Injuries and wounds of vulva, 479
Insemination, incapacity for, 442
Inspection of abdomen, 306
of vulva, 297
Instruments, mode of cleaning, 330
operating, 340
Intercourse, sexual. (See *Coitus.*)
Internal os, 134
Intra-uterine applications, 381
injections, 582
counter-indications, 585
to prevent dangers of, 584
medication, 578. (See also *Applications.*)
Lente on, 39
value of, 377
medicator, Palmer's, 579
Wylie's, 428
scarification, knife for, 614
Inversion of inverted uterus, operation for, 57, 62
Inverted uterus, reduction of, by White and others, 37
Iodine, Churchill's tincture of, 564
in chronic metritis, 615
Iodized phenol, 580
Iodo-tannin, 564
Iron as a tonic, 364
in chronic metritis, 612
Irrigation, antiseptic, in operations, 330, 331
of uterus, 332

J.

Journal of Obstetrics, American, 63

K.

Knife, Emmet's ball-and-socket, 345
for scarification, 614
Kolpo-hysterectomy, first case of, 55

L.

Labia, hypertrophy of, obstacle to coitus, 447
inversion of hair of, 502
majora, anatomy of, 98
anatomy, gross, of, 100
minute, of, 101
minora, anatomy of, 101
arteries of, 104
malformations of, 266
treatment of hypertrophy of, 477
oozing tumor of, 531
Labial hernia, anterior, 482
Lacerations of cervix, cause of dyspareunia, 450
cause of subinvolution, 651
operation for, 43
Laparo-elytrotomy, 46, 56
Latent gonorrhœa, 48, 691
Lateral displacement of uterus, 148
Left lateral position, description of, 308
digital examination in, 310

Left lateral position, objections to, 309
speculum in, 310
Leptothrix vaginalis, 500
Levator ani muscle, 226
spasm of, 515
Ligament, infundibulo-pelvic, 79
Ligaments, round, 157
of bladder, 207
sacro-uterine, feel of, 127
uterine, 213
anatomy of, 207
support the uterus, 221
Ligatures, silk, mode of cleaning, 330
Lipoma of vulva, 530
Literature, lists of, 93, 278. (See note in *Index of Authors* for other pages.)
Local treatment of uterine disease, 376
Lupus, anti-septics in, 523
bacillus tuberculosis in, 519
of vulva, 518
perforans, 521
prominens, 521
serpiginosus, 521
treatment of, 523
Lymphangitis, adeno-, 680, 759
Lymphatics of uterus, anatomy of, 139, 686

M.

Malformations, hindrances to coitus, 446
of clitoris, 266
of hymen, 262
of ovaries, 235
of uterus, 238
of vagina, 257
of vulva, 264
Massage, general, 632
uterine, 53, 616
value of, 375
Masturbation, diagnosis of, 478
Melanoma of vulva, 536
Membrana granulosa, formation of, 84
Membranous dysmenorrhœa, 434
pathology, 435
treatment, 435
Menopause, 436
symptoms referred to, 293
treatment of, 437
Menorrhagia, electricity in, 391
theory of, 48
Menstruation, absence of, 411
disorders of, electricity in, 388
excessive, 415
normal, 408
theories of, 409
painful, 419
questioning about, 287
scanty, 413
theory of, 59
vicarious, 415
Mensuration of abdomen, 307
Mental disease due to sexual disease, 50
Mercury, action of, on disease of sexual organs, 372
Mesosalpinx, development of, 79
Mesovarium, development of, 77
Metritis, acute, 546
chronic, causes, 602
diagnosis, 606
glycerin and boro-glyceride in, 615
iron in, 612
parenchymatous, 599
quinine in, 630
sponge tents in, 616
stages of, 601
symptoms, 605
treatment, 609
general, 610
special medication, 611
varieties, 604
Metrorrhagia, cancer as cause of, 417
curetting in, 418
fibroids as cause of, 416
treatment of, 417
Microscope in diagnosis, 327
Mineral waters, value of, 610, 627
Mitchell's, Weir, treatment, 610, 633
Mons Veneris, anatomy of, 97
Moral treatment, 635
Morgagni, columns of, 198
hydatids of, 238
Mucous membrane, uterine, 140
of cervix, 142
of the new-born, 91
of uterus, 136, 140
Müllerian ducts, development of, 85
Muscles, levator ani, 226
of pelvic floor, 225
of perineum, 230
Myoma of vulva, 529
Myrtiform caruncles, 118
Myxoma of vulva, 530

N.

Needle-holder, Emmet's, 348
Needles, mode of use, 347
varieties of, 347
Negro race, hymen of, 263
Nerve-sedatives, 372
Nerve-tonics, 364, 372
Nerves of clitoris, 109
and vessels of perineum, 232
of uterus, 143, 155
of uterus, 140, 142, 146
of vagina, 124
of vulva, 100
Nervousness, treatment of, 634
Neuralgia of coccyx, 516
ovarian, electricity in, 393
Neuroma, case of, causing dyspareunia, 452
of vulva, 536
New growths of vulva, 518
Nitrate of silver within the uterus, 581
Nitric acid as application, 565, 580
Nuck, canal of, 158, 160, 236
cyst in, 188
Nymphæ, anatomy of, 101. (See *Labia Minora*.)

O.

Obstetric Gazette, 65
Œdema of vulva, 75, 495
Oidium albicans, cause of pruritus, 506
Ointments for intra-uterine use, 581
Oozing tumor of labia, 531
Operation for lacerated cervix, 58
for perineal rupture, 54, 55, 59, 234
for retroversion, 56
Operations during pregnancy, 334
plastic, 346
preparatory treatment, 336
two at once safe, 335
when to be done, 333
Opium in pelvic inflammation, 374
use of, in operations, 333
Orgasm, effect on uterus, 443
Os, contraction of, 561
external os tincæ, 133
internum, 134
Osteoma of vulva, 536
Ova, formation of, 80
number of, 84
Ovarial tubes, 174
Ovarian corpuscle, Drysdale's, 43
disease and dysmenorrhœa, 419
neuralgia, electricity in, 393
tumors, diagnosis from hæmatocele, 758
electricity in, 398
works, writers on, 64
Ovaries, absence of, 236
anatomy of, 107
gross, 169
minute, 172
blood-supply of, 179
color of, 169
descent of, 78
development of, 76
indications for removal of, 40
malformations of, 236
position of, 167
practical deductions from anatomy of, 181
prolapse of, 53
relations and attachments of, 168
to the tubes, 79
removal of, Battey on, 39, 49
rudimentary, 237
size of, in children, 85, 169
supernumerary, 236
Ovariotomist, McDowell the first, 24
Ovariotomists, early American, 27
Ovariotomy, drainage in, 45
enucleating the pedicle in, 38
high temperature after, 51
Lyman on, 28
septicæmia following, 37
vaginal, 40, 50
Thomas on, 38
Ovaritis, electricity in, 393
Ovary, apoplexy of, 745
bulb of, 180
epithelium covering, 172
hæmatoma of, 749
prolapse of, 37, 181
Ovary, prolapse of, in dyspareunia, 451
Oviducts. (See *Fallopian Tubes.*)
Ovula Nabothii, 143
Ovule, non-maturation of, 459
obstruction to passage of, 461
Ovulation, incapacity for, 458
Ovum, anatomy of, 177
primordial, 84

P.

Pachydermia of vulva, 524
Pachysalpingitis, 167
Packing the vagina, 53
Pain as symptom of uterine disease, 259
Palpation of abdomen, 307
Papilliform plexus, 180
hemorrhage from, 745
Papilloma of vulva, 530
Paradidymis, 76
Parametritis (see *Cellulitis*), 705
Parenchymatous metritis, chronic, 599
Parotitis following operations on genitals, 58
Parovarian cyst, cause of, 75
Parovarium, 75, 180
Pathology of endometritis, chronic cervical, 550
chronic corporeal, 569
of membranous dysmenorrhœa, 435
of pelvic cellulitis, 708
hæmatocele, 743
peritonitis, 689
of subinvolution of vagina, 668
Pedicle, enucleating the, 38
Pediculosis pubis, 505
Pelvic abscess. (See *Abscess.*)
chronic, 56, 60
cellulitis, electricity in, 404
pus in, 710
exudation in, 715
connective tissue, anatomy of, 215
disease, physical signs of, 293
effusions, Brickell on, 49
floor, anatomy of, 222
muscles of, 225
physics of, 233
projection of, 234
spasm of muscles of, 511
hæmatoma, 764
induration, treatment of, 51
inflammation caused by gonorrhœa, 691
use of opium in, 374
peritoneum, anatomy of, 204, 682
peritonitis, 687
complicating dysmenorrhœa, 420
electricity in, 404
hot douche in, 754
sinuses from abscess, 732
vessels, enlargement of, 156
obstructions in, 155
Pencils, gelatin, 563
Perimetritis (see *Peritonitis, Pelvic*), 687
Perineal body, anatomy of, 228
function of, 233
hernia, 487

Perineal rupture, operation for, 54, 55, 59, 234
Perineorrhaphy, Jenks on, 52
Perineum, 229
failure in operations for rupture of, 42
muscles of, 230
nerves and vessels of, 232
primary operation for rupture of, 481
rupture of, operation for, 42, 54, 55, 59, 234
veins of, 103
Peritoneum, pelvic, 682
anatomy of, 204, 682
changes in pregnancy, 206
folds of, 207
Peritonitis, encysted tubercular, 58
hæmorrhagica, 741
following hæmatocele, 747
pelvic, 687
abdominal section in, 704
cause of, 690
chronic form, 696
common form of pelvic inflammation, 700
complicating dysmenorrhœa, 420
diagnosed from hæmatocele, 759
diagnosis, 697
electricity in, 404
exacerbations in, 695
following operations on cervix, 698
minor forms, 698
pathology of, 689
physical signs, 696
prognosis, 701
septic form of, 694
symptomatology, 693
treatment, 702
tumors in, 606
tubercular, 58, 692
Periuterine adenitis and angeioleucitis, 680
hæmatocele, electricity in, 397
inflammation, 675
definition, 675
diagnosis, 658
etiology, 677
history, 675
Permanganate of potash, 365
Pessaries, invention of, 62
in dysmenorrhœa, 434
Pessary, Hodge's invention of, 27
Phenol, iodized, 580
Phlegmon of broad ligament. (See *Cellulitis.*)
diagnosed from pelvic hæmatocele, 763
Phlegmonous vulvitis, 493
Phosphates as nerve-tonics, 334
Phosphorus, use of, 373
Physical signs of pelvic disease, 293
Pityriasis versicolor of vulva, 504
Placenta, retained, causing subinvolution, 653
Plicæ palmatæ, 137
Plica urogenitalis, 68
Position, dorsal, 297
erect, examination in, 316
Position, genu-pectoral, examination in, 315
in gynecological diagnosis, 296
left lateral, examination in, 310
of uterus in diagnosis, 300
Post-partum hemorrhage, causing subinvolution, 653
Practical deductions on anatomy of ovaries, 181
of pelvic connective tissue, 219
of pelvic peritoneum, 213
of rectum, 202
of urinary organs, 193
of uterus, 147
of tubes, 165
of vagina, 125
of vulva, 114
Precocity, 239
Pregnancy, early diagnosis of, 149, 151
in double uterus, 252
operations during, 334
treatment of cervix during, 567
tubal, 56
Preparatory treatment to operations, 336
Primordial ovum, 84
Probe, Emmet's flexible, 315
introduction of, 315
Prognosis of endometritis, chronic cervical, 555
chronic corporeal, 575
of pelvic cellulitis, 718
hæmatoma, 766
peritonitis, 701
of sterility, 468
Prolapse, artificial, of uterus for diagnosis, 325
of ovary, 53, 181
Sims's operation for, 37
Prurigo of vulva, 503
Pruritus of vulva, 505
treatment of, 507
caused by oïdium albicans, 506
Pudendal hernia, 486
sac, 230
Pudendum. (See *Vulva.*)
Pus in pelvic cellulitis, 710

Q.

Quinine, use of, 373
after operations, 333
in chronic metritis, 630
in menstrual disorders, 367

R.

Rectal examination, methods of, 301
Simon's method of, 302
exploration, 29
by eversion, 38
Rectocele, definition of, 487
Rectum, anatomy of, 197
gross, 198
minute, 250
examination of, 318
practical deductions on anatomy of, 202

Rectum, relations and attachments of, 201
sphincter of, 199
symptoms, importance of, 291
Remedies acting on pelvic organs, classification of, 368
Rest as a therapeutic agent, 619
Retroflexion as cause of dysmenorrhœa, 423
of gravid uterus, diagnosis, 756
Retroversion, operation for, 56
Roman gynecology, history of, 20
Rosenmüller's organ, 75
Round ligaments, cyst of, 488, 535
of uterus, 157
Rudimentary uterus, 242
Rupture. (See *Hernia.*)
of perineum, failure in operation for, 42
operation for, 54, 55, 59, 234

S.

Sarcoma of vulva, 537
Scarification, knife for, 614
Scissors, Emmet's, 344
Sclerosis, uterine, 599
Sebaceous cysts of vulva, 535
Sedatives, nerve, 372
Semen without spermatozoa, 453
Senile changes in vagina, 120
Septic wounds, treatment of, 332
pelvic peritonitis, 694
Septicæmia following ovariotomy, 37
Serpiginous vascular degeneration, 509
Sexual sense in women, 444
Shield, Sims's, 352
for twisting sutures, 352
Silk for sutures, 339
ligatures, mode of cleaning, 330
Silver nitrate in endocervicitis, 564
in endometritis, 581
suture, invention of, 33
sutures, 339
application of, 348
shouldering of, 351
twisting of, 351, 352
Simon's speculum, 341
spoon curette, 361, 597
Simpson's sound, 302
use of, 303
Sims's depressor, 311
position, description of, 308, 340
sharp curette, old model, 597
shield, 352
speculum, objections to, 310
tenaculum, 314
Sinus, urogenital, 69, 88, 89
Sinuses, pelvic, from abscess, 732
Skene, glands of, in urethra, 71, 180, 185, 796
Skin diseases of vulva, 501
Societies, gynecological, 66
Solid uterus, 242
Sound, best form of, 302
care in use of, in pelvic hæmatocele, 753
Simpson's, 302
the uterine, 362
Sounds, graduated, 357
Spasm of muscles of pelvic floor, 511
Spear, Buttle's, for cervix, 613
Specula, cylindrical and plurivalve, 304
Speculum, Brewer's, 305
Fergusson's, 305
Hunter-Erich's, 310
invention of, 20–22
Mann's, 312
Mundé's, 313
Nott's, 306
Simon's, 341
Sims's, advantages of, 306, 311, 340
invention of, 31
mode of use, 313, 340
Spermatozoa, absence of, in semen, 453
destruction of, in cervix, 454
impediments to progress of, 455
mode of entry into uterus, 43
progress of, 445
Sphincter recti, 199
of bladder, 189
of urethra, 186
third, 198
uteri, 135
Sponge-holder, Sims's, 343
Sponges, mode of cleaning, 330
Spoon, Simon's sharp, 361, 597
Spurious hermaphrodism, 277
Stem, intra-uterine, for drainage, Wylie's, 429
Stenosis of cervix, dangers of incision for, 151
uteri, electricity in, 405
Sterility, 441
abnormal conditions of, 463
caused by latent gonorrhœa, 460
diagnosis of, 464
examination in, 466
hidden causes of, 467
prognosis, 468
subjective symptoms of, 462
table of abnormal conditions in, 463
treatment, 468
Strychnia, value of, as a tonic, 364
Subinvolution, electricity in, 393
non-puerperal, 601
operations on vagina in, 673
of uterus, 599, 637
caused by tumors, 652
course and results, 659
diagnosis, 655
diagnosis from chronic metritis, 659
differentiation, 657
etiology, 649, 653
exciting causes of, 650
histology, 642
history of, 638
local treatment, 664
mechanical treatment, 666
operative treatment, 666
physical signs 656
symptoms of, 655
treatment, 661
of vagina, 667
cause, 669

Subinvolution of vagina, pathology, 668
treatment, 671
post-partum hemorrhage causing, 653
Sun-baths, 621
Superfœtation, relation of, to double uterus, 253
Superinvolution, electricity in, 395
Supports of the uterus, 221, 534
of bladder, 225
Sutures, materials for, 338, 339
removal of, 353
Symptoms, importance of, 288
of chronic metritis, 605
of pelvic peritonitis, 693
of sterility, subjective, 462
of subinvolution of uterus, 655
Syphilitic ulceration of cervix, 593
condyloma of vulva, 534
warts of vulva, 534
Syringe, applicator, 581

T.

Table of abnormal conditions in sterility, 463
of differential diagnosis of pelvic hæmatocele, 763
operation, 337
Tables, gynecological examining-, 294
Tampon, lampwick for, 362
vaginal, 361
Temperature, high, after ovariotomy, 51
Tenaculum, Emmet's, 314
double, 342
Mann's, 312
operating, 345
self-retaining, 577
Sims's, 314
Tents in treatment of endometritis, 560
laminaria, 321, 356
mode of use, 323, 356
sponge, 321, 355
sponge in chronic metritis, 616
tupelo, 322, 356
Therapeutics, general uterine, 363, 619
Thrombus of the vulva, 497
Tissue-forceps, 345
Tonic, strychnia, value of, 364
Tonics, use of, 630
Touch, vesico-vaginal and vesico-rectal, 45
Treatment, constitutional, of chronic uterine disease, 363, 619
moral, 635
of atresia vulvæ, 478
of atrophy of uterus, 618
of cervix during pregnancy, 567
of chronic metritis, 609, 610, 611
of constipation, 390, 627
of disorders of menopause, 437
of dysmenorrhœa, 425
of endometritis, chronic cervical, 555
corporeal, 575
of epispadias, 477
of headache, 634
of hypertrophy of labia minora, 477
of hypospadias, 477
Treatment of lupus, 523
of membranous dysmenorrhœa, 435
of metrorrhagia, 417
of nervousness, 634
of pelvic abscess, 727
adhesions, 51–54
amenorrhœa, 364, 413
cellulitis, 60
hæmatoma, 767
induration, 51
peritonitis, 702
of pruritus vulvæ, 507
of septic vulva, 332
wounds, 332
of sterility, 468
of subinvolution of vagina, 671
of uterus, 661, 664, 666
preparatory to operations, 336
Weir Mitchell's, 610, 633
Tubal pregnancy, operation in rupture of sac, 56
Tube, Fallopian. (See *Fallopian Tube.*)
anatomy of, 161
anatomy of, minute, 164
development of, 87
malformation of, 237
practical deductions from anatomy of, 165
surgical relations of, 167
Tubercular peritonitis, 58, 692
Tubes, ovarial, 174
Tumor of labia, oozing, 531
Tumors, diagnosis from subinvolution, 658
in pelvic peritonitis, 606
of uterus, causing subinvolution, 652
ovarian, diagnosis from hæmatocele, 758
Twisting forceps for wire, 352

U.

Ulceration of cervix, 587
syphilitic, 593
of vulva, 494
Urachus, 88
Ureter, malformation of, 261
Ureters, anatomy, 192
catheterization of, 195
surgical relations of, 196
Urethra, anatomy of, 183
gross, 185
minute, 186
button-hole of, 54
Skene's glands of, 70
sphincter muscle of, 186
vesical opening of, 187
Urethral caruncles as a cause of dyspareunia, 451
Urethro-vaginal fistula, Parvin's operation, 38
Urinary organs, anatomy of, 183
practical deductions from anatomy of, in pregnancy, 193
Urogenital sinus, 69, 88, 89
Uterine appendages, 161
disease of, complicating dysmenorrhœa, 420

Uterine decidua, 140
depletion, value of, 379
disease, pain as a symptom of, 259
displacements, electricity in, 390
fibroids removed through anterior vaginal wall, 56
fungosities, 594
hyperæmia, 599
hypertrophy, 599
massage, 53, 616
sclerosis, 599
sound, 302
subinvolution, 599
therapeutics, 363, 619
Uterus, abnormal communication, 257
anatomy, gross, 134
minute, 137
anteflexion as malformation, 256
arcuatus acordiformis, 247
arrest of development of, early, 240
later, 254
artificial prolapse for diagnosis, 325
atresia of, 253
atrophy of, 599
attachment to vagina, 150
bicornis acollis, 244
bipartitus, 243
bleeding from external coat, 153
cavity of, 134
development of, 87
didelphys, 245
dimensions, 132, 152
double, in pregnancy, 252
relation to superfœtation, 353
duplex separatus, 244
excessive development of, 239
fœtalis or infantilis, 254
gravid, injuries of, 55
hernia of, 257
hyperplasia of, electricity in, 404
incudiformis, 255
lymphatics of, 139, 686
malformations of, 238
in development, 256
massage 53, 616
mobility, 147
in pelvic hæmatocele, 759
of mucous membrane of, 136, 140
of cervix, 142
nerves of, 140, 142, 146
obliquity of, 256
os internum, construction of, 152
parts of, 133
parvicollis and acollis, 256
position, 131
as regards symptoms, 351
in diagnosis, 300
practical deductions from anatomy of, 147
in pregnancy, 193
pubescens, 255
relations to surrounding parts, 147
round ligament of, 157
rudimentary, 242
septus, 248
softening of tissues, 151
solid, 242
sphincter of, 135
stenosis, electricity in, 405
subinvolution of, 637
subseptus, 249
unifolis, 250
supports of, 221, 534
ulceration of cervix, 154
unicollis, 246
vaginal extirpation of, 156
vessels and nerves, 143, 155
Utricular glands, 140

V.

Vagina, arteries and veins of, 122
atresia of, 257
as obstruction to coitus, 458
blind canals of, 260
development of, 87, 92
double, 259
faulty communications, 260
malformations of, 257
nerves of, 124
operations on, in subinvolution, 673
packing the, 53
practical deductions from anatomy of, 125
relations of, 124, 128
senile changes in, 120
shortness as cause of dyspareunia, 450
stenosis as cause of dyspareunia, 449
subinvolution of, 667
veins of, 105
walls of, 119
Vaginal discharge as symptom, 292
examination, method of, 298
extirpation of uterus, 156
hernia, 483
hysterectomy, position for, 128
ovariotomy, 40, 50
tampon, 361
Vaginismus, 511
as cause of dyspareunia, 449
superior, 515
Valve of Houston, 198
Varicose veins of vulva, 497
Vascular degeneration, serpiginous, 509
Veins, air in, from injections, 583
of perineum, 103
of vagina, 105
Venereal condyloma of vulva, 537
warts of vulva, 531
Ventral hernia, 60
Vesico-rectal examination, 302
touch, 45
Vesico-uterine pouch, 214
Vesico-vaginal fistulæ, operation for, 30, 50
touch, 45
Vessels of the uterus, 143
pelvic, enlargement of, 156
obstructions in, 155
of vagina, 122
and nerves of perineum, 232
of uterus, 143, 155
Vestibule, anatomy of, 110

Vestibule, bulbs of, 112
Viburnum prunifolium, 49
Vicarious menstruation, 415
Vulsellum forceps, 342, 349
Vulva, alopecia of, 500, 501
  anatomy of, 96
  angeioma, 536
  atresia of, 267
    treatment, 478
  cancer, carcinoma, 539
    epithelioma, 537
  cancer of, 537
  cysts of, 534
  development of, 92
  eczema, acute, 503
    chronic, 514
  enchondroma, 536
  erysipelas of, 504
  erythema, 503
  fibroma and fibro-myoma of, 529
  fibroma diffusum of, 526
  gangrene of, 496
  gaseous tumors of, 536
  hæmatoma of, 497
  hemorrhage from, 115
  herpes of, 512
  injuries and wounds of, 479
    from coitus, 480
      labor, 480
  lipoma of, 530
  lupus of, 518
  malformations of, 264
  melanoma, 536
  myoma of, 529
  myxoma of, 530
  nerves of, 100
  neuroma, 452, 536
  new growths of, 518
  œdema, 75, 495
  osteoma of, 536
  papilloma of, 530
  pediculosis pubis of, 505
  pityriasis versicolor of, 504
  pointed condyloma of, 531
Vulva, practical deductions from anatomy of, 114
  prurigo of, 503
  pruritus of, 505
  sarcoma, 537
  skin diseases of, 501
  syphilitic warts of, 534
  thrombus of, 497
  ulceration and fissure, 494
  varicose veins of, 497
  warts of, 530, 531, 534
Vulvitis as cause of dyspareunia, 449
  diphtheritic, 492
  follicular, 492
  gonorrhœal, 492
  phlegmonous, 493
  simple, 490
Vulvo-vaginal glands, anatomy of, 116
    cysts of, 534
  gland, catarrh of, 499
    inflammation of, 500
      of duct, 499

W.

Warts of vulva, 530, 531, 534
  vulva caused by gonorrhœa, 536
Water, hot-, douche. *See Douche.*
  mineral, value of, 610
Weir Mitchell treatment, 610, 633
White line in pelvis, 226
Wolffian bodies, development of, 73
  ducts, development of, 68
Wounds of vulva, 479
  septic, treatment of, 332
Woman's Hospital of State of New York, Alumni Association of, 60
    foundation of, 35

Z.

Zinc as nerve-tonic, 373
  chloride in endocervicitis, 565
Zona pellucida, 84, 177

END OF VOLUME I.

Date Due

CAT. NO. 23 233 PRINTED IN U.S.A.

UC SOUTHERN REGIONAL LIBRARY FACILITY
A 000 510 138 1

WP100
M282s
1887
v.1
Mann, Matthew D
A system of gynecology...

WP100
M282s
1887
v.1
Mann, Matthew D
A system of gynecology...

MEDICAL SCIENCES LIBRARY
UNIVERSITY OF CALIFORNIA, IRVINE
IRVINE, CALIFORNIA 92664